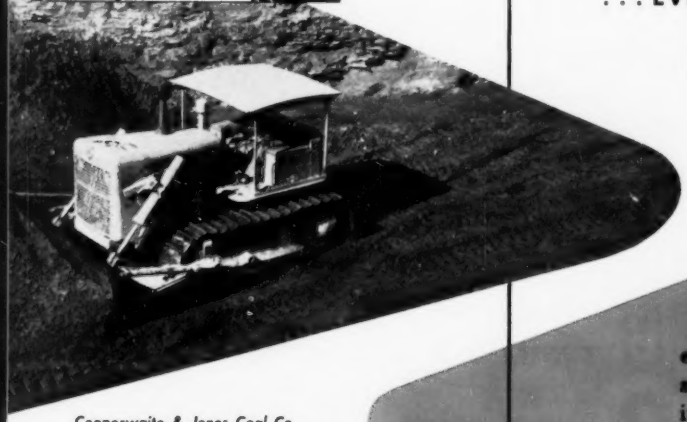
June, 1956
Volume 33, No. 6

COAL MINING

I've got an expert equipment engineer on my staff at no extra cost!

...EVERY *Highway* CUSTOMER CAN MAKE THIS STATEMENT!



▲ *Cooperwaite & Jones Coal Co., La Jose... Allis-Chalmers HD-16*

• For Highway's trained, experienced equipment specialists are always at your service. They are glad to give you factual information and advice about equipment applications and new developments that will save you *time and money!* Naturally, there's no cost or obligation on your part.

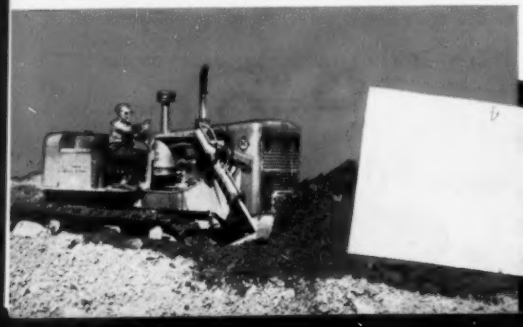
AA-2489

▲ *Kristianson & Johnson Coal Co., Lanse... Allis-Chalmers HD-21*

Penn State Coal Co., Du Bois... Allis-Chalmers HD-21 ▼

▼ *McIntire Coal Co., Brockway... Allis-Chalmers HD-16*

Allis-Chalmers • International Vibro Tampers • Jaeger • Power-Pack Conveyors • General Motors Diesel Engines • Gar Wood • Erie Bins • Master • Thor • Michigan Tractor Shovels and Excavator-Cranes • Lima Shovels, Cranes, Draglines



COMPANY
Pittsburgh 6, Pa.

MINE COAL the Modern, Economical Way

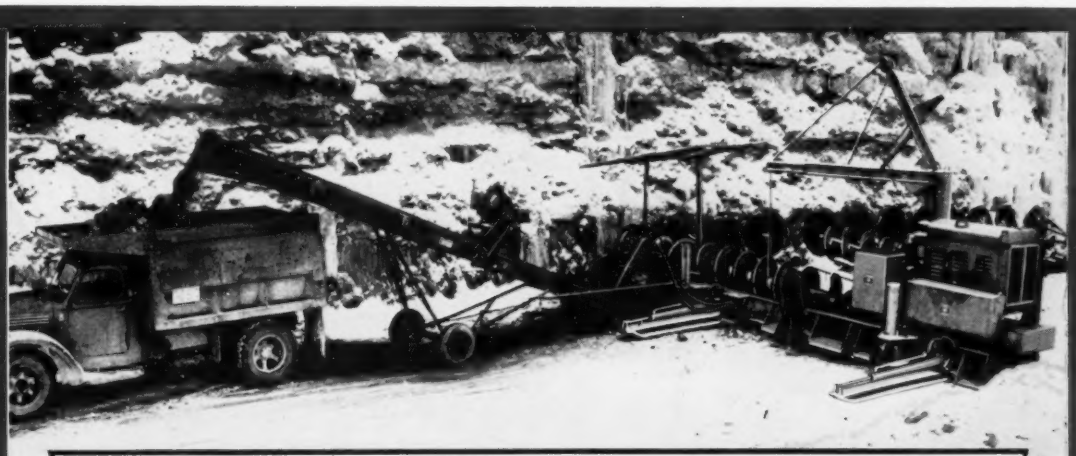
. . . with Bucyrus-Erie Stripping Shovels

Bucyrus-Erie stripping shovels are helping to hold costs in line wherever there are large-scale coal stripping operations. For example, this 1050-B shovel handles the major share of stripping in an Indiana coal mine.

These full-revolving shovels provide the balanced performance and long working range that mean consistently high output as well as low operating costs. From boom point to crawler treads you will find leadership in stripping shovel design —with such features as exclusive two-section boom, twin dual hoist ropes, powerful effective rope crowd with crowd machinery located on main deck and not on the boom, individual motor drive for each crawler unit, outstanding electrical power and control equipment.

Today, as always, it will pay you to investigate the Bucyrus-Erie line of stripping excavators. Capacities range up to 65 cubic yards. 90L56C

SOUTH MILWAUKEE BUCYRUS ERIE WISCONSIN



McCARTHY AUGER DRILLS

- 60 TO 75 TONS PER HOUR
- SELF-MOVING FROM HOLE TO HOLE
- 2- OR 3-MAN CREW
- MINES HIGH-QUALITY COAL

● Twelve models of McCarthy Coal Recovery Drills auger-mine bonus coal at THE LOWEST operating cost per ton. They operate easily in narrow strip pits. Hydraulic controls simplify alignment, augering and changing position. Let us recommend the right cost-saving model for your property. Write for Bulletin M-101 and M-102.

SELF-PROPELLED

Horizontal Earth and Rock Boring Auger Drills 150 ft. Drilling Depth

● The self-propelled unit permits speedy, economical blast-hole drilling from hole to hole. It takes just a few seconds to disengage the power unit from the auger drive shaft, change position, and begin drilling again. The unit is easily attached to the McCarthy truck-mounted earth and rock boring drills now in use.

TRUCK-MOUNTED

● Truck-mounted horizontal drills are highly versatile. The drilling unit mounts lengthwise or crosswise on the truck bed for spotting hole locations faster. Drilling height from the ground ranges from 4½ to 7 ft. Four separately operated levelling jacks permit close alignment. Write for Bulletin M-105.

HEAVY-DUTY VERTICAL

Model 106-24—World's Fastest Heavy-Duty Vertical Auger Drill

● Bores vertical blast holes faster than any other auger drill. New gear reduction permits slower auger rotation for drilling larger holes deeper in harder rock formations. Augers 8" and 9" dia. drill holes to depths of 125 ft. for use of new type explosives. Controls can be placed at rear and auger racks can be furnished if desired. Write for Bulletin M-100.

FINGER-TIP CONTROL

HEAVY

Gives Desired Rotating Speed Of Auger

RUGGED

HYDRAULIC FEED

Provides Any Speed Up To 6 Feet Per Minute Horizontal Feed Of Drill

POWERFUL

MANUFACTURED BY

THE SALEM TOOL COMPANY

741 SOUTH SALEM-DEITZ AVE. • SALEM, OHIO, U. S. A.

SALEM

Printed monthly by Basset Press & Mailing Company, Published by Modern Mining Publishing Co., Executive Publisher P. F. JASIK, 4575 Country Club Drive, Pittsburgh, Pa. Price: in the United States, $3.00; all other countries $5.00. Single copy 50 cents SECOND CLASS mail privileges authorized at Pittsburgh, Pennsylvania.

No job too tough

for equipment from Highway!

HD-21 backfilling at New Shawmut Coal Co., Hollywood

Even the toughest jobs are easy for the Allis-Chalmers HD-21 and Lima 2400. And, these two machines are typical of all the fine equipment sold, serviced and guaranteed by Highway.

For a common sense explanation on how equipment from Highway can save you money and speed up production, call your Highway representative today!

AA-5965

Lima 2400 stripping overburden at James E. Hoffman's near Karthaus, Pa.

Highway EQUIPMENT COMPANY

6465 Hamilton Ave. • Pittsburgh 6, Pa.

ALLIS-CHALMERS • GENERAL MOTORS DIESEL ENGINES
MASTER • INTERNATIONAL VIBRO-TAMPERS • JAEGER
MICHIGAN TRACTOR SHOVELS AND EXCAVATOR-CRANES
POWER-PACK CONVEYORS • GAR WOOD • ERIE BINS
LIMA SHOVELS, CRANES, DRAGLINES • THOR

COAL MINING

Vol. XXXV June, 1956 No. 6

Contents

Do You Know 5

Here and There in the Coal Industry 5

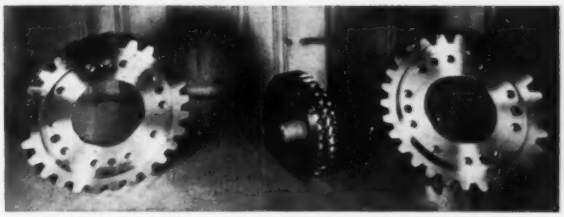
Holiday and Vacation Practices 6

Twelfth Annual Meeting
Electrical Division
Open Pit Mining Association 9

CYPAK 11

New Equipment 21

New Appointments 24



Helical and Worm Gears for Joy 14BU Loaders
BRONZE, HELICAL and WORM GEARS
unconditionally guaranteed

Licking View Tool & Machine Co.
CAMDEN ROAD ZANESVILLE, OHIO
Distributed by
LEE SUPPLY CO. Charleroi, Pa.
OHIO VALLEY MINE SUPPLY CO. Huntington, W. Va.

HAZLETON
TYPE "PE"
U.S.B.M. APPROVED PORTABLE PUMP
70 G. P. M. 20 Ft. T. D. H.
¾ H. P. 230 Volt D. C.
Overall Length, 30" & 50"
HAROLD C. LUSK CO.
3045 W. Liberty Ave., Pittsburgh 16, Pa. LOcust 1-4191
5210 Kentucky St. So. Charleston 6, W. Va. POpular 8-6258

Published by
Modern Mining Publishing Company
Editorial Offices
4575 Country Club Drive
Pittsburgh, Pa.
Phone TU. 1-9411
P. F. JASIK,
Publisher and Editor

Philadelphia Representative
PAUL S. KEISER
1729 Ridgeway Road
Havertown, Pa.
Hilltop 7-1090

Printed by
BASSET PRESS
AND MAILING COMPANY
377 McKEE PLACE
PITTSBURGH 13, PA.

LONG INTRODUCES SELF-TRAMMING MOBILE CONVEYOR

The Long Company, Oak Hill, West Virginia, has introduced—and now has in production—a new, revolutionary mobile room conveyor head.

With this unique conveyor drive, conveyor moves are greatly simplified, resulting in an estimated time saving of up to sixty per cent. Because the unit is crawler mounted and self-tramming, one man can move it to a new working place in a matter of minutes with no trouble or effort whatsoever. All that is necessary is the disconnecting of the conveyor pans and chain from the mobile head, and moving two control handles. The unit will tram itself at a rate of fifty feet per minute. Also, time is saved in positioning the conveyor drive at its new location because this can be done by power instead of manually.

For tramming, the LONG mobile conveyor uses a simple hydraulic system driven by the conveyor motor itself without additional electrical parts. It is equipped with a 15 to 40 hp motor to suit a wide range of individual requirements and is furnished with either LONG standard or solid return-trough pans. Capacities to 5 tpm are standard and operating lengths to 500 feet are practical, depending on load and grades.

For additional details on LONG mobile room conveyors, write the manufacturer at P. O. Box 331, Oak Hill, W. Va.

SALEM "HERCULES" AUGERS FOR ELECTRIC DRILLS
Made To Withstand High Drilling Speed, Whip And Torsional Strain Of Electric Drills

Drills holes faster— Will not snap off shank or chip points— Outlasts four or five ordinary augers.
THE SALEM TOOL COMPANY **SALEM, OHIO, U.S.A.**

Allis-Chalmers

model D

THE LOW-COST MOTOR GRADER THAT OFFERS

more of everything...

more PRODUCTION-BOOSTING FEATURES

Choice of Allis-Chalmers engines

GASOLINE — 50 brake hp. Bare grader weight —8,800 lb. Four forward speeds to 25.6 mph, one reverse to 3.3 mph.

DIESEL — 50 brake hp. Bare grader weight — 9,350 lb. Four forward speeds to 25.2 mph, one reverse to 3.2 mph.

ROLL-AWAY moldboard rolls the load instead of pushing it, moves more dirt, uses less power.

Plus one-piece tubular frame, tandem drive, real operator comfort, hydraulic blade lift.

USEFUL OPTIONAL FEATURES

Power circle turn for faster, easier, better control of blade . . . turns 135 degrees.

Leaning front wheels with heavy-duty axle, for better control in close quarter-work.

Hydraulically shiftable moldboard to speed work around obstructions. Shifts 16 in. each way.

Special large tires for added traction, long wear. Front (7.50-20 or 8.25-20) and rear (8.25-20).

more JOB-MULTIPLYING ATTACHMENTS

Hydraulic scarifier, mounted amidships for maximum effective ground pressure.

Shoulder maintainer for safe, one-pass operation. Also available: one-pass windrow eliminator.

Rear-mounted 5/8-yd loader for fast, low-cost handling of materials.

plus snowplows, completely enclosed standup cab, hydraulically operated mower.

more SATISFIED USERS

Since its introduction in 1949, thousands of satisfied owners have *proved* the usefulness and low-cost versatility of the Model D on all kinds of construction and maintenance.

Call your Allis-Chalmers Construction Machinery Dealer for a demonstration today!

ALLIS-CHALMERS, CONSTRUCTION MACHINERY DIVISION
MILWAUKEE 1, WISCONSIN

ALLIS-CHALMERS

ROLL-AWAY is an Allis-Chalmers trademark.

Do You Know?

ELECTRONIC "BRAINS"

Giant electronic "brains" are growing up. They no longer have to be spoon-fed their information but are being equipped with automatic devices to feed themselves.

Many computers are now "fast, flexible and faithful" enough to process experimental evidence directly, thus relieving scientists of routine chores, Dr. Nicholas Metropolis of the Los Alamos Scientific Laboratories said here.

He told the American Physical Society meeting that electronic "brains" are now being used as laboratory tools. At the University of California, Berkeley, pictures taken of atomic smash-ups in liquid hydrogen bubble chambers will be scanned photoelectrically and the information so gained fed directly to an electronic "brain."

Another computer, the MANIAC, at Los Alamos, is making calculations in "eighteen-dimensional space" in an attempt to decipher what happens when charged particles called pions smack into the hearts of hydrogen atoms.

Other problems Dr. Metropolis said are being tackled with the aid of computers range from designing more powerful atom smashers to setting up realistic models of the atomic furnaces that stoke stars like the sun.

The aim, he said, is not to produce a complicated set of numbers but to extract a simple idea from them.

AUTOMATION

• Automation can mean an era wherein each worker is an individual artisan, Dr. Elmer W. Engstrom, executive vice-president of research and engineering for the Radio Corporation of America, predicted.

Addressing the Centennial Symposium on Modern Engineering, sponsored by the University of Pennsylvania, Dr. Engstrom said that the increasing use of automation seems likely to lead us to a return to the era in man's history when "each trained man was an individual artisan."

Outlining the degree of automation being applied today, the RCA executive pointed out that the completely automatic factory does not yet exist.

"This ultimate form of automation," he stated, "could be described as a very large black box into which raw materials and data flow automatically for processing and distribution."

In addition to the use of automation in the factory and on the production line, there is also a growing trend in offices toward electronic data handling, he said.

Automation, like a chain reaction, will mean an immediate general upgrading of workers, and following some adjustment,

(Continued on Page 22)

Here and There in the Coal Industry

J. W. KIDDY

APPOINTMENT OF J. W. KIDDY as manager of the rotary drill and air tool divisions of Davey Compressor Co., Kent, Ohio, is announced by J. T. Myers, vice president.

A graduate of Kent State University, Mr. Kiddy has been associated with the company for the past 6 years. He formerly served as east-central district manager and later as assistant sales manager of the portable compressor division at the Kent plant.

In his new post he will direct sales of Davey truck mounted rotary drills for all types of construction, mining, oil and water well drilling. He will also be in charge of the air tool division which includes paving breakers, rock drills, clay spades, sheeting drivers, backfill tampers and accessories. Mr. Kiddy's headquarters will be at the Davey plant in Kent.

THE ELK HORN COAL CORP. ANNUAL MEETING. All members of the board of directors and officers of The Elk Horn Coal Corp., were re-elected at the annual meeting of stockholders in Charleston, W. Va. Board members are W. W. Goldsmith, president of the Corporation; George Ward, vice president; Nathaniel F. Glidden, Arthur B. Koontz, and John P. Sheather. Other officers reelected are W. J. Jackson, secretary and treasurer, and G. H. Wilson, assistant Secretary-treasurer.

POCAHONTAS OPERATORS ELECT. Henry F. Warden, president of American Coal Co. and vice president of Pocahontas Fuel Co., Inc., was reelected president of the Pocahontas Operators Association, Bluefield, W. Va., at the Association's annual meeting on March 30 in New York. W. W. Walker, president of Ashland Mining Corp., was elected vice president. Others reelected were Roland C. Luther, executive vice president of Peerless Coal and Coke Co., as treasurer of the Association, and B. B. Housman as secretary. Executive committee reappointees, in addition to Messrs. Warden, Luther, and Walker, were William Beury, J. J. Foster, A. R. Matthews, W. F. Leatherman, and Norton Stone.

GEO. E. ENOS, president, The Enos Coal Mining Corp., Cleveland, and Frank Nugent, executive vice president of the Freeman Coal Mining Company, Chicago, were elected directors of the National Coal Association.

CHANGES IN NCA BOARD OF DIRECTORS. Mark E. Eastin, Jr., president of West Kentucky Coal Co., Madisonville, Ky., has been nominated for membership on NCA's board of directors to fill the vacancy left by the resignation of Hooper Love, former president of the West Kentucky concern.

HOLIDAY AND VACATION PRACTICES

IN THE COAL MINING INDUSTRY

By Robert D. Henderson[1]
Bowling Green State University
Bowling Green, Ohio

The coal industry gives every indication of being in a much better condition than in several years. Producing, personnel, marketing and pricing segments, generally speaking, are in a sounder competitive position. Most companies in the industry appear to have definitely "turned the bend" insofar as corporate experience is concerned. It is true that some coal corporations have diversified their activities to a great extent and this diversification has contributed to overall improvement. Even in such concerns, the remaining coal divisions report general improvement.

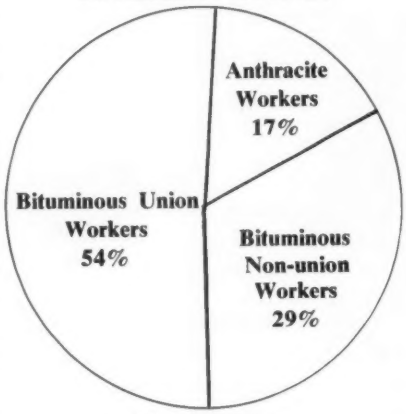
The coal industry is characterized by interesting comparisons with respect to holiday and vacation practices. The union and non-union segments both show individual similarities and differences. A study, completed in early 1956, gives a comprehensive view of these matters. Twenty-four usable replies were received, 50,000 workers were included, and results tabulated on a union and non-union basis.

Types of Companies

This study includes thirteen replies covering union workers in the bituminous coal industry, seven replies concerning non-union workers in this segment of coal mining, and four replies representing anthracite workers. Chart 1 presents this information in percentage form.

1. The author acknowledges the cooperation of Keith Cutright in conducting the survey incorporated in this article.

CHART 1
TYPES OF COMPANIES COVERED IN SURVEY



Corporate Age of Companies

Although a few of the companies covered are relatively new, a large majority are long-established ones. Non-union companies ranged from 40 to 80 years in corporate age. Union companies included many of both the newer and the older companies with an age range from 17 to 127 years. Chart 2 shows the number of firms with various working forces.

Number of Workers Employed

The number of workers employed by the non-union mines ranged from 300 to 6750 men per mine. The range for union mines was from 150 to 8000 workers.

Workers covered in this survey numbered just over 50,000. Non-union workers accounted for about 17,000 of this total while about 35,000 were employed by union mines. For size of companies, both union and non-union, in terms of workers employed, see Chart 3.

CHART 2
CORPORATE AGE OF COMPANIES

Age	Union Companies							Non-Union Companies						
	1	2	3	4	5	6	7	1	2	3	4	5	6	7
120-130	X													
110-120														
100-110	X													
90-100														
80-90				X										
70-80									X					
60-70								X						
50-60			X					X						
40-50		X						X						
30-40		X						X						
20-30	X													
0-20	X													

CHART 3
SIZE OF COMPANIES BY NUMBER OF MINE EMPLOYEES

Workers	Union Companies							Non-Union Companies						
	1	2	3	4	5	6	7	1	2	3	4	5	6	7
7000 to 8000	X													
6000 to 7000								X						
5000 to 6000														
4000 to 5000	X							X						
3000 to 4000								X						
2000 to 3000				X										
1500 to 2000	X									X				
1000 to 1500				X										
500 to 1000			X											
0 to 500	X							X						

I. Vacation Practices

Since 1933, the American coal miner has witnessed a great change in his economic status. Prior to this time, the miner had won various pay raises, shorter working hours, and other gains that were very important. Little consideration had been given, however, to most of the fringe benefits, including vacations and holidays, that are commonly provided today. Through the United Mine Workers, especially during the period since 1940, the miner has received holidays and vacation periods comparable to those in other industries. These practices have spread to non-union mining which now, in many cases, provides a better holiday and vacation program than the unionized segment of the industry.

Vacations and Their Basis

All companies represented in this study, union and non-union, grant paid vacations. Companies that are signatories of the National Mine Wage Agreement have a uniform policy of twelve calendar days of vacation after the worker has been employed for one year. Vacation for employees who have worked less than one year is prorated according to the amount of time he has worked.

Vacation provisions vary among the non-union companies. One company uses the uniform type of vacation plan. In this, all employees who have fulfilled a predetermined service requirement receive a uniform amount of vacation. The remainder of the non-union companies allow vacations on the graduated plan. Under this plan, workers receive increasing vacation allowances according to additional service with the company until a maximum is reached. Two companies failed to present information concerning vacation allowances. Table 1 shows service requirements and vacation allowances for workers in the non-union companies.

Extent of Vacation Season

The vacation period, as provided by the September 1, 1955 amendment to the National Bituminous Coal Wage Agreement of 1950, is specified as a span of twelve days falling during the last week of June and the first week of July. The specific dates of this vacation period are set forth each year.

Non-union reporting companies did not set specific dates during which vacation could be taken. Three companies permitted vacations to be taken at any time. Table 2 shows the span of time during which vacations may be taken by employees of companies restricting the vacation season. Although the vacation season varies among these companies, it is restricted for all companies to the period between April and October.

(Continued on next page)

TABLE 1
SERVICE REQUIREMENTS AND VACATION ALLOWANCES FOR WORKERS IN NON-UNION COMPANIES

Service Requirements	VACATION ALLOWANCE					Total	Percent
	2 days	5 days	10 days	14 days	21 days		
6 months	1*	1				2	18
1 year		1	2	2		5	45
2 years			1			1	10
10 years						0	0
15 years					3	3	27
Total	1	2	3	2	3	11	
Percent	10	18	27	18	27		100

*One company states that for a length of service of 6 months but less than one year, vacation with pay will be "2 days to 2 weeks depending upon employment date in preceding year."

Vacation Pay in Advance

The union contract provides that the vacation payments for each vacation period shall be made on the last pay day occurring in the month of June of that year. This would provide the vacation pay before the vacation period, or at least in the early part of the vacation period. The majority of the non-union companies in the study provide vacation pay in advance, either voluntarily or upon request by the employee. Chart 4 presents this information for non-union companies along with the basis for such payments.

II. Holiday Practices

The union policy does not provide for paid holidays. It does, however, provide that all nationally recognized holidays that are worked by the miner shall be paid at double time rates. This includes April 1, which is the National Miner's Holiday or John Mitchell Day. Of the non-union companies surveyed, all but two provided paid holidays. These companies all provided at least six such holidays per year. Chart 5 shows the number of companies paying the various holidays.

TABLE 2
EXTENT OF VACATION SEASON—MONTHS DURING WHICH VACATIONS MAY BE TAKEN—NON-UNION COMPANIES*

Month Vacation Season Begins	MONTH VACATION SEASON ENDS			
	August	September	October	November
April				1
May			2	
June		1		

*Some of the companies allowed vacations to be taken at any time subject to the approval of the company. These companies are not represented on this chart.

CHART 4
PAY POLICIES FOR VACATIONS —NON-UNION COMPANIES

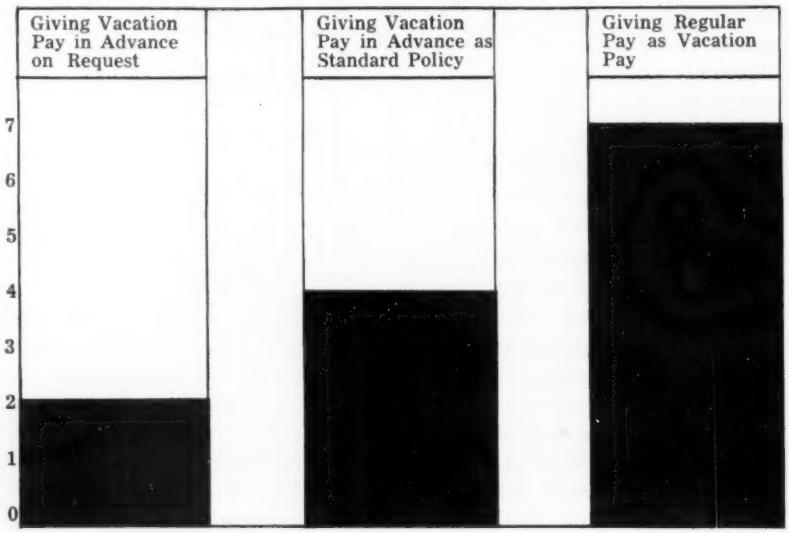
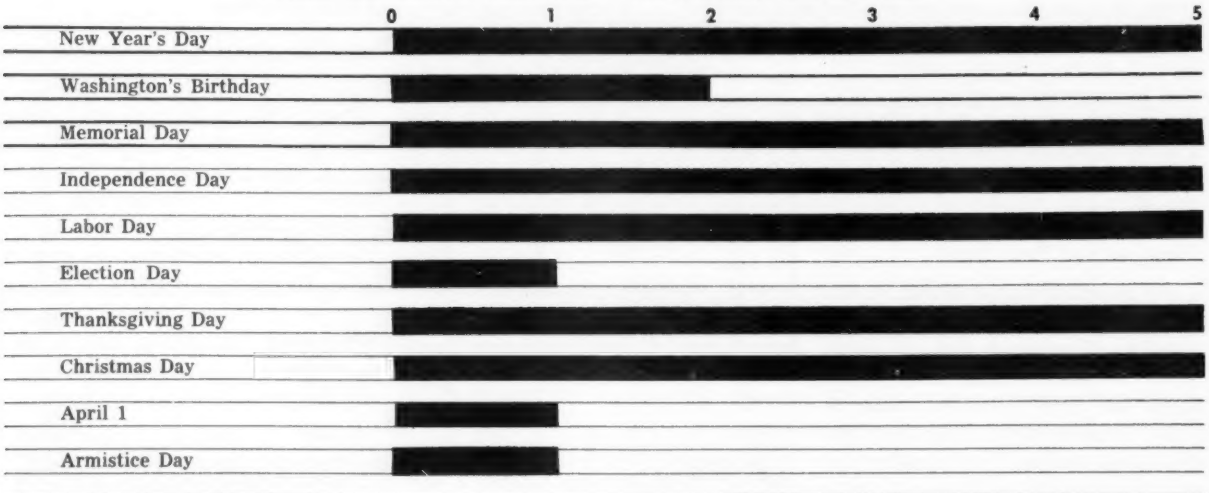
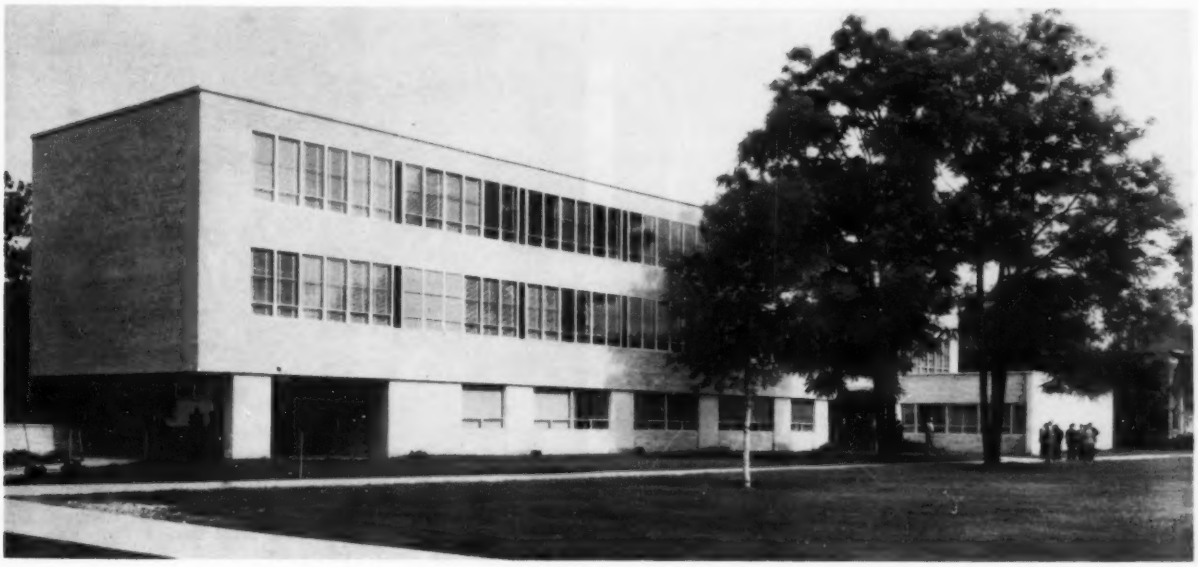


CHART 5
PAID HOLIDAYS ALLOWED—NON-UNION COMPANIES





Jobst Hall Auditorium at Bradley University.

Twelfth Annual Meeting, Electrical Division, Open Pit Mining Association

The 12th annual meeting of the Electrical Division of the Open Pit Mining Association was held in Jobst Auditorium, Engineering Building, of the Bradley University, Peoria, Illinois, June 7.

Following is a reproduction of the meeting program. Following the program is reproduced the paper by W. B. Weathers of the Westinghouse Electric Corporation.

Chairmen

Morning Session: Louis B. Dodd, Professor Electrical Engineering, Bradley University.

Afternoon Session: Francis C. Mergen, Head, Department of Industrial Engineering, Bradley University.

Morning Session

8:30 CDST — Registration, Jobst Hall Auditorium, Engineering Bldg.

9:30—Welcome to Bradley University. Harold Potter Rodes, President, Bradley University.

9:45—"Electrical Control on Dirt Moving Equipment." Dan Heiple, Chief Field Engineer, LeTourneau-Westinghouse Company, Peoria, Illinois.

R. M. Leseney, President, opening the meeting.

10:30—"Can It Be Automated?" R. J. Vandewalker, Sales Engineer, W. F. and John Barnes Company, Rockford, Illinois.

11:15—"CYPAK—A New Concept in Industrial Control." W. B. Weathers, Mgr. Director Systems, Westinghouse Electric Corporation, Pittsburgh, Pennsylvania.

12:00—Luncheon — The Wigwam, Bradley University Cafeteria.

Afternoon Session

1:15—Movie.

1:30—"Gear Tooth Contours." J. J. Stolz, Asst. Vice President—Engineering, The Tool Steel Gear & Pinion Company, Cincinnati, Ohio.

2:15—"Wheel Excavators." Morton Sundnes, Design Engineer, Bucyrus-Erie Company, South Milwaukee, Wisconsin.

3:00—"Performance of 6900-Volt Shovel Equipment." J. F. Weis, Electrical Engineer, Marion-Power Shovel Company, Marion, Ohio.

6:15—Social Hour. Jefferson Hotel.

7:00—Banquet. Dinner Speaker — Fred Wiedemann, Illinois Bell Telephone Company, Chicago, Illinois. "Sun, Sand, and Transistor."

(Continued on Next Page)

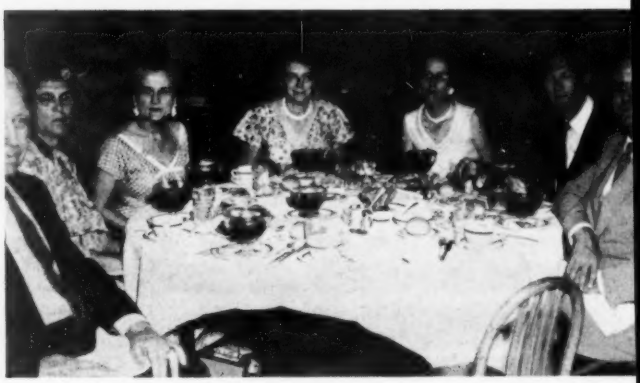
Left: L. A. Selleg, Mineral Resources Div., Westinghouse; J. F. Weis, Marion Power Shovel Co., R. M. Leseney, Truax-Traer Coal Co.; L. E. Briscoe, Ayrshire Collieries and Secretary of the Association.

Left: R. L. Taylor, Peobody Coal Co.; Chas. Bledsoe, Stonefort Corp.; John T. Stolz, Tool Steel Gear & Pinion Co.; Morten Sundnes, Bucyrus-Erie Co.

Left: Fred Wiedeman, Principal speaker and Eldon Crown, both with the Illinois Bell Telephone Co., Merle Yontz, President LeTourneau, Westinghouse Corp., R. E. Gibbs, Dean, Bradley University.

Left: F. M. Bohan, M. A. Hanna Co., Hibbins, Minn.; Mrs. and Mr. Chas. E. Crawford, Midland Electric Coal Co.; Mrs. and Mr. J. C. Rettenmayer, United Electric Coal Co.; Mrs. Chas. Bledsoe, G. E. Jones, U. S. Rubber Co.; Mrs. Francis M. Bohan.

There was one hour of charm before the dinner.



Left: L. H. Schickedanz, United Electric Coal Co.; Mrs. R. E. Gibbs, Mrs. R. M. Leseney, Mrs. E. D. Stoetzel, Mrs. and Mr. Kasien, LeTourneau-Westinghouse Corp.; and E. D. Stoetzel, Peoria Manufacturers Association.

CYPAK— A New Concept in Industrial Control

In April of each year we hold a meeting for the electrical people in the Machine Tool Industry called the Machine Tool Electrification Forum, the idea being to give these engineers a place to meet and discuss mutual electrical problems.

At our Forum in April, 1954, one of the audience suggested in reply to a question directed at the open forum audience that we should develop a control circuit relay having no moving parts.This was in reply to the question of what changes are desired from the electrical industry in control apparatus. There was considerable laughter from the audience as the very idea of building a control circuit relay without moving parts was at first thought rather absurd. This chap had good reason for his statement, however, bearing in mind he is a plant engineer in the automotive industry and he is well aware that it costs his company $1,800 a minute for a shutdown on their engine production line. Through the years we have gained a lot of information from similar comments at these particular meetings wherein we have a large number of engineers from the machine tool, automotive, and farm equipment industries; and we did not quickly pass off the suggestion this man made.

Just to give you an idea as to what was in our minds back in those days (just two years ago) before this suggestion, we knew the demand was growing for a control circuit relay which would have considerably greater life. We knew that although the usual control circuit relay could withstand around 15 million operations it was basically the same device that could withstand 5 million operations 30 years before. We knew, to use the words of one of our physicists, "a relay is an electro-mechanical device" and we knew we had been banging our heads against the laws of physics in trying to increase relay life.

To set our perspective, I thought you might like to see the photograph of the industrial type control circuit relay this gentleman preferred we replace with a device having no moving parts. This conventional control circuit relay costs about $15 and is a 10 ampere device—so rated by NEMA. It is used for sequencing in control applications of all types. The life of this device today in some circuits will mean a control life of five months; whereas on other less repetitive machines, this may be five years. Either application would require regular maintenance.

What happens to it in use? Well, we have and still do manufacture relays, of course, but springs may break, contacts burn, bearings pit, coils fail, etc. This, then, is the relay this engineer from industry said should have no moving parts in order to eliminate maintenance and in order to get greater control reliability.

And here, then, is today's design of what we introduced to do this control job. As you can see, there are no moving parts and it is, therefore possible — after installing control using these elements — to virtually lock the cabinet door, put the key in your pocket, and forget it.

Hard to believe? Well, a little later I'll show you pictures of just such a control padlocked in a large plant where the only key is kept 45 miles from the control itself. But more details on the device and applications a little later. This new apparatus, called CYPAK control, is made possible through making use of the newly named science of cybernetics. In fact, that is where we get this name CYPAK; that is, "CY" for cybernetics and "PAK" for package — meaning packaged cybernetics. It is proposed today that our nerve cells are energy centers of our nervous system and that they behave—oddly enough—in digital or step-function fashion. It seems most nerve cells have a number of receptors and this is particularly true within the human brain itself. These receptors serve as input devices to the nerve cells. The nerve cells evidently do not produce an output until they have obtained a certain threshold value determined by the simultaneous presence of all inputs from the various receptors. The brain pays little attention to messages from only a few receptors. For instance, a hot needle can be pressed against the skin with no great discomfort. But press an equally hot iron against it and a general alarm goes out. It is felt our every human action is performed through these digital nerve processes. Combining this information with what we know of logic, we can conclude that our brain achieves logical thought processes through just four functions. These are called the AND, OR, NOT, and MEMORY functions. In the AND function, for instance, all the receptors must be feeding pulses into the nerve cell at very nearly the same time. In the NOT function—which is a negative function — the nerve cell is prevented from firing by the presence of an inhibitor receptor.

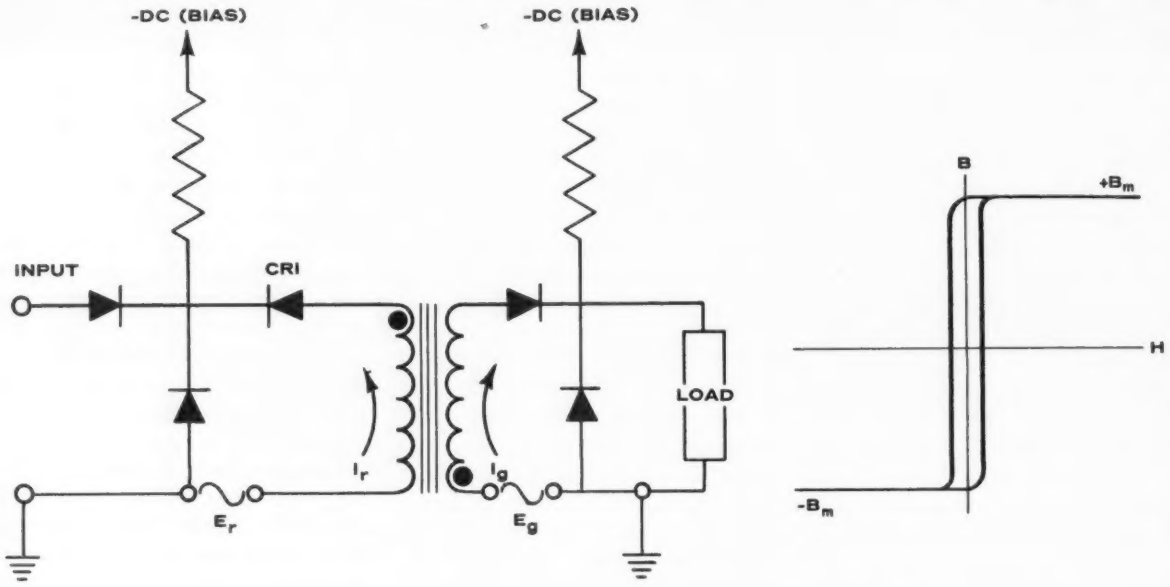
And how then did we use these so-called logical functions in designing an electrical control device? Well, let's look and see.

We have four relay contacts in series. If contacts A, B, C, and D are closed, then we get power to the coil CR1. It is easy to see this is a relay performing an AND function. Now let's look at the symbol for our logical CYPAK element to do this same job. Here if we have inputs A and B and C and D, we get an output E from the element. From this, you can see it is possible to perform a logical control function with either a relay or a CYPAK element. There is an outstanding difference between the two, however, as is illustrated here.

The relay is inherently a device with one input and a number of outputs; whereas the CYPAK element is a device with a number of inputs and one output. The CYPAK element was, of course, designed this way knowing it would be used in logical circuits and as such is more easily used in logical control work.

Let's go ahead and look at our

(Continued on Next Page)



Complete CYPAK control system for a Warner & Swasey Electro-Cycle turret lathe gains compactness and accessibility by mounting CYPAK elements and power amplifiers inside cabinet doors.

other comparisons between relays and static elements. Here, we have four relay contacts in parallel so that closing either A or B or C or D will allow power to the coil CR1.

As compared with this, either input A or B or C or D into our CYPAK OR element will give output E.

A normally closed relay would be one having normally closed contact A. As long as there is no power to the coil for contact A, there is power to coil CR1. In other words, as long as there is no input to coil A, there is output from the circuit. We call this a NOT circuit. In our CYPAK NOT element, if we have no input A there is an output E, or with input A there is not output E. In other words, this is our contrary function—some of us refer to it as the female member of our family.

In this circuit of an electrically sealed-in relay, if we push the button A there will be power to coil CR1, which will seal in contact CR1 to retain our circuit until button B is depressed. As compared with this, our MEMORY element is designed such that with input A we will get output E until such time as input B turns off the element.

Is this beginning to add up for you? Well, then let's look at a logical circuit we can quickly understand. This will illustrate how we are able to use these logical functions in making a control decision.

Cigarette Story

Now let's get a little closer to our subject of electrical control. Here we have a simple relay schematic where by if either contact A or contacts B and C are closed, then we get power to coil CR1. To do this simple circuit with CYPAK control we will need one AND and one OR element; and then with inputs B and C we get output BC which when fed into an OR element will give power to coil CR1. Or, input A alone will give power to coil CR1. You can easily see this logical circuit performs the same function as the relay circuit I just showed you.

I mentioned we began working on a broad basis to locate a proper static device to do this job of replacing conventional control circuit relays. Well, one of our men who was faced with this engineering problem had developed a MAGAMP circuit some years ago which made possible faster operating digital circuits. This chap's name is Bob Ramey, and Dr. Ramey is head of our New Products Engineering Department. His circuit is called the Ramey amplifier and had never been used very much since he developed it. With some additional work, however, we found this Ramey circuit ideal for performing logical control. Before we go ahead, here is a 2 Input AND element circuit using the Ramey MAGAMP magnetic amplifier principle. But rather than looking at this completed as you see it, let's step back and analyze the circuit so we can better understand the Ramey amplifier circuit principle.

We are all familiar with the usual saturation curve or B/H curve for transformer electrical steel. As you can see, there is considerable slope to this curve. A considerable change in H is necessary to make a noticeable change in B. This steel is not acceptable for use in magnetic amplifiers. Just prior to the war the Germans had developed a core material and had magnetic amplifiers operating in some of their Naval Gun training systems during the war. Just after the war the grain oriented steels became available in this country. Our particular trade-name on one of these is Hypernik—which is a 50% nickel,

(Continued on Page 17)

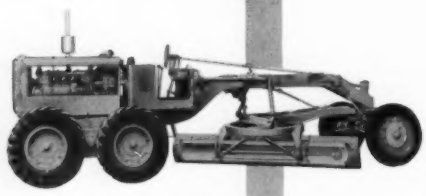
WHEREVER BETTER ROADS
ARE BUILT... YOU'LL FIND

PROFIT-MAKING

CAT
MOTOR GRADERS

YOUR CATERPILLAR DEALER TELLS YOU WHY!

CAT* Motor Graders



No. 12 — 115 HP

No. 112 — 75 HP

No. 212 — 50 HP

Count Cat Motor Graders at work on turnpikes . . . highways . . . farm-to-market roads . . . wherever better roads are built . . . and you'll find *more of these profit-making machines on more jobs than any other make.* Here's just one example—on one of the nation's largest turnpike projects, actual count of all contractors' motor graders showed that 81.9% of the total were Cat Motor Graders—117 out of a total of 143!

Records like this and many more prove that Cat Motor Graders are first choice with successful contractors, everywhere. The big reasons for this preference are the proved low cost, high production and long-lived performance of these famous machines.

If you aren't yet taking advantage of this superior performance and the big money-making opportunities of Cat Motor Graders, see us, soon. We'll estimate your motor grader needs exactly, recommend the right sized Cat Motor Grader, give you an on-the-job demonstration, and offer you a good trade-in on your present equipment.

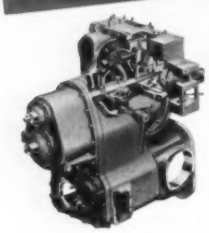
CATERPILLAR*

*Caterpillar and Cat are Registered Trademarks of Caterpillar Tractor Co., U.S.A.

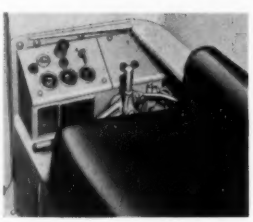
CAT MOTOR GRADER SPECIFICATIONS

	No. 12	No. 112	No. 212
Engine	Diesel, four-stroke cycle		
Blade range:			
Lift above ground	16″	15½″	14½″
Side shift (right or left)	40″	36″	33¾″
Maximum bank cutting angle	90°	90°	90°
Maximum shoulder reach (measured outside rear wheels)	7′ 4″	6′ 5″	5′

NEW ADVANCEMENTS . . . FOR GREATER PRODUCTION, LOWER OPERATING COSTS



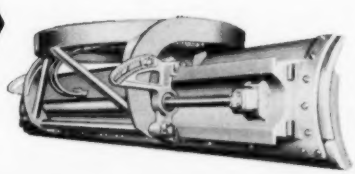
NEW, EXCLUSIVE CAT OIL CLUTCH is now standard on the Cat No. 12 Motor Grader. Oil clutch gives up to five times longer life than ordinary dry-type clutches, requires fewer adjustments, reduces clutch maintenance and replacement costs.



GASOLINE OR DIRECT ELECTRIC STARTING. Optional gasoline starting engine with 6-volt starting motor or a new 24-volt direct electric starting system. No. 12 and No. 112 have in-seat controls with both starting methods. No. 212 has in-seat controls with direct electric starting.

NEW TUBELESS TIRES are now standard on all Cat Motor Graders. Tubeless tires eliminate an estimated 80% of down time caused by tube-type tires, are easier and quicker to mount, hold air longer, run cooler, give better puncture and blowout protection.

NEW HYDRAULIC MOLDBOARD SHIFT, optional on the No. 12 and No. 112, saves operator time . . . permits maximum right or left lateral moldboard shifting without the operator leaving the driver's seat.

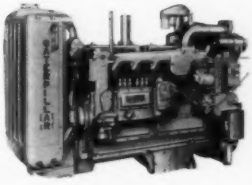


...first choice with successful contractors!

Ditch cut to bank cut in less than a minute without link adjustment is one of the many reasons for the great popularity of Cat Motor Graders.

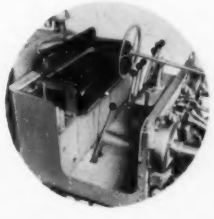
PLUS THESE TIME-PROVED FEATURES!

BALANCE OF POWER, WEIGHT AND SPEED! Frame, engine, transmission, final drive, circle and mechanical controls are all Cat-designed, Cat-built. No. 12 and No. 112 feature constant-mesh transmissions for easier shifting.

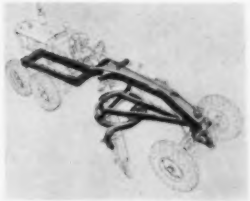


LONG-LIFE CAT DIESEL ENGINE! Oil-cooled, aluminum alloy pistons —"Hi-Electro" hardened cylinder liners and crankshaft journals contribute to superior engine life. No-adjustment, non-fouling fuel system guarantees complete burning of non-premium fuel.

MECHANICAL CONTROLS WITH BUILT-IN LONG LIFE! Cat Motor Grader mechanical controls assure fast operation, positive and accurate control. Anti-creep brakes hold blade in set position. Inexpensive, removable shear pin prevents damage to control mechanism.



STRUCTURALLY STRONG MAIN FRAME! Cat Motor Graders have the strongest-built main frames of all motor graders in their class! Triple box section frames are fabricated from special rolled channels to resist shock and strain of rough operation.



LOOK TO THE DEALER BEHIND THE PRODUCT FOR...

Original CAT Parts and Service

...when you need them... right on your job!

Save valuable machine time... get greatest efficiency from your machine operators by calling us for original Cat parts and service... whenever needed... right on your job. You don't have to move your equipment off the job. Our trained mechanics, driving modern, well-equipped field service trucks, can be on your job within a short time. Our factory-approved methods can put your Cat equipment in top-notch, producing shape in minimum time. Just call us when you need us. Our names are listed at the right.

Look to These Names for the Finest in Construction Equipment

YOUR CATERPILLAR DEALER

BECKWITH MACHINERY COMPANY

6550 Hamilton Avenue PITTSBURGH	
Old Town Road CLEARFIELD	
East Broadway FARRELL	PA.
361-369 Congress St. BRADFORD	
1356 E. 12th St. ERIE	
Buckhannon Pike CLARKSBURG	W. VA.

OHIO MACHINERY CO.

6606 Schaaf Road CLEVELAND	
930 Kinnear Road COLUMBUS	
2807 Reynolds Road TOLEDO	OHIO
U. S. Route 250 CADIZ	
4000 Lake Park Road YOUNGSTOWN	

WALKER MACHINERY CO.

1545 Hansford Street CHARLESTON	
4010 Emerson Avenue Route #2 PARKERSBURG	W. VA.

CM-5V

YOU CAN COUNT ON YOUR CATERPILLAR DEALER!

Printed in U.S.A.

P656A

50% iron alloy. The saturation curve on Hypernik is noticeably different from transformer grade steel. With only a slight change in H, it is possible to get a great change in B, and which is necessary in order to be able to control the saturation of a magnetic amplifier with only a slight amount of control power. This steel development, then, made possible the manufacture of magnetic amplifiers that were originally conceived many years before.

Using this Hypernik steel we mentioned and assuming we have an AC voltage BG as given in the diagram, we would of course cause IG to flow through the coil. This would saturate the coil in the first positive half cycle. In the next negative half cycle, no current could flow in the opposite direction due to the rectifier. In the next positive half cycle, the core would still be saturated and could not absorb any more voltage, so we would then get a voltage across the load. We will call this voltage EG then, the gating voltage. Note this is not a controlled output.

Now, if we add another coil to our core, and if we applied an AC voltage ER to this side of the circuit, we could then use ER to desaturate the core. To do this, we would let ER be the proper polarity so that IG would flow during the negative half cycle of EG. (When this rectifier blocks IG from flowing). We would then have a circuit where IG positively saturates the core and on the following half cycle IR drives the core to negative saturation. We call this saturating and resetting the core.

If, then, we add these components to our circuit, we have arranged it so an input signal can be fed into the circuit and with proper polarity this input signal can be used to block this rectifier to keep IG (reset current) from flowing and which will block reset of the core. The core will be saturated and, then, on the next positive half cycle of EG, we will get voltage across the load. You will now see we use the input signal to control core reset and which means we use the input signal to control the output.

This is a more complete circuit. We have added the bias resistor circuit. DC's applied to the reset circuit so that the current through this rectifier is larger than the peak value of IR, so that the reset current flow through this rectifier is in the forward conducting direction. Consequently, this rectifier presents a low resistance and the reset current flows. When an input voltage greater than ER is applied, the current in this rectifier tends to drop to zero. The effective rectifier resistance is then its leakage resistance — a high value. IR is then blocked from flowing through the rectifier and the core is not reset. We then get output on the load. The rectifier added across the load presents a low impedance to exciting current flow but a high impedance when the circuit produces an output.

This, then, is the 2 Input AND circuit you will recall you saw before and now this is much easier to understand. As long as we get two inputs simultaneously, we block the flow of reset and thereby get voltage across the load. In addition to this element, we have a O Input AND element and a 1 Input AND element—plus an additional AND input element which can be used to obtain any number of inputs beyond 2. In addition, our other elements include NOT, OR, MEMORY, and time delay.

We have analyzed control circuits as consisting of these parts—sensing element (which could be a pushbutton, a limit switch, a pressure switch, etc.), logic (which is the thinking part of the circuit), output amplifier (which is used to amplify the intelligence signal up to a useable power level), and output device (which could be the pneumatic or hydraulic solenoid valve, the motor starter, etc.). CYPAK control today is that in the dotted lines. All CYPAK elements operate at low power level—as they only handle intelligence.

And here's how our static control looks. This machine is called a vane loader and does just that. The vanes are stacked in this cartridge and then as the torus indexes, the vanes are loaded automatically into the torus. This particular torus is for the hydromatic and the machine is installed at the General Motors Detroit Transmission plant. I had earlier mentioned reliability and no maintenance as being the features of static logical control. Here production is a must and the fact that it is possible to load vanes in a torus in 24 seconds with CYPAK vs. 29 seconds with conventional relays is extremely important. This machine uses 15 relays vs. 23 CYPAK elements.

As for comparative costs, on this particular G.M. control the CYPAK control costs 25% more than conventional relay control. For this, G.M. has a control which will require no maintenance vs. conventional relay control which will virtually wear itself out in 4 to 6 months during which time the control will have operated 10 to 15 million times. The CYPAK control should last over 10 years.

HOW ELEMENT WORKS

CYPAK elements operate on magnetic amplifier principles along with a unique circuit—the Ramey amplifier. Here is how the CYPAK element works:

Two windings are put on a core of Hipernik® V grain oriented magnetic steel. The core provides a very sharp hysteresis loop, as shown on the right, below. By proper rectifier circuitry, current Ig is made to flow in one winding (gate) in such a direction as to always drive the core toward positive saturation, indicated by +Bm on the hysteresis loop. Once the core has become saturated, it will absorb no more energy from the gate winding. Consequently, if, for the sake of discussion, the second winding (reset) is temporarily ignored, the result after the first cycle is a half-wave output at the load. This, of course, is not a **controlled** output.

To control the output, a current Ir is made to flow in the reset winding

(Continued on Next Page)

in such a direction as to drive the magnetic core toward complete saturation in the negative direction. By arranging the phasing so that the two currents Ir and Ig, are 180° out of phase, i.e., diametrically opposed, the core will oscillate between positive and negative saturation.

In so oscillating, the core absorbs all of the voltage from both windings and no output appears. If an input is introduced in the reset circuit, as shown, it blocks the rectifier CRI so that Ir can no longer flow. Hence, the current Ig first saturates the core and then appears across the load on the next positive ½ cycle. The response is consequently ½ cycle.

Thus, the output has been controlled by an input signal—which is the same as a relay in character. This circuit is not intended as an identical circuit for a CYPAK element, of course. It is, however, the basis of CYPAK circuitry and consequently shows the method of operation.

This circuit emphasizes some important departures from previous procedures. First of all, CYPAK is a low power system. The gate voltage is 15 volts, the reset voltage is 8 volts, and the d-c bias voltage is 23 volts. The input power level is about 15 milliwatts and the output is about 300 milliwatts.

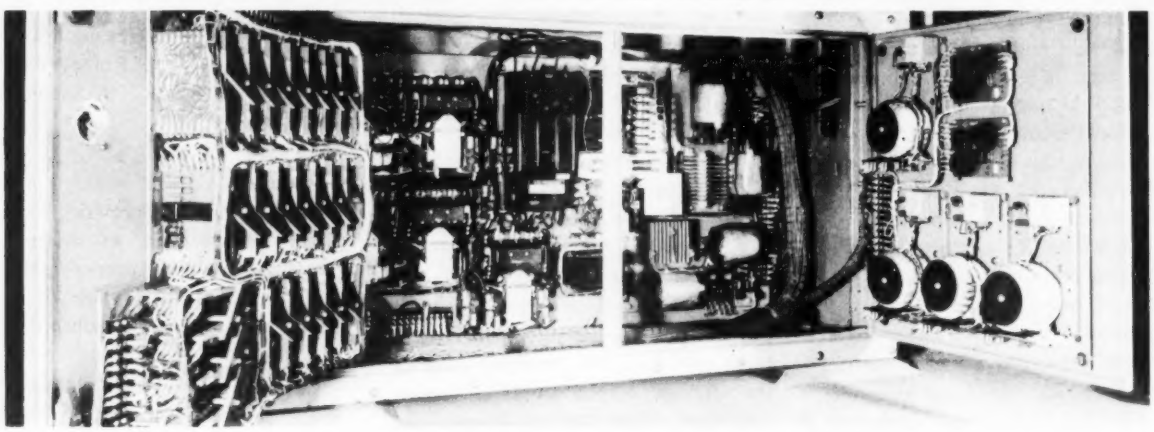
It is very apparent that this is not enough power to perform power switching such as switching a motor. We therefore, use this output to control a CYPAK output amplifier which itself operates the motor starter. The CYPAK amplifier has an output of 115 volts a-c, 60 cycles, in a number of standard sizes.

APPLICATION . . . .

The application of CYPAK is dependent on the so-called logic function approach. This is not a difficult approach, but it is different from the common relay approach. Using the four elements—AND, OR, NOT and MEMORY—any circuit function can be achieved. Let's look at a simple example. Though it does not show how CYPAK replaces relay systems, it does give a glimpse of the logic function approach.

Suppose we look at the logic process involved in a man's having himself a morning smoke. To smoke a cigarette, he must have the cigarette AND a light AND the desire to smoke. Obviously, an AND element with three inputs is required. But we did not specify what kind of a smoke so we should also consider a pipe. Here he must have a pipe AND tobacco AND a light AND a desire. Again, an AND element is required, this time with four inputs. However, the man will not do both at once, so we must feed the outputs of the two AND's to an OR. Like most men, however, this man will NOT smoke before breakfast. Here a NOT element is required to produce a signal at all times when no input (breakfast) is present.

Now with the output from the OR we can supply an "On" signal to a MEMORY element and with the output from the NOT we can supply an "Off" signal to the same element. Thus, we get an output from the MEMORY — and consequently a smoke—only after the man has had breakfast.

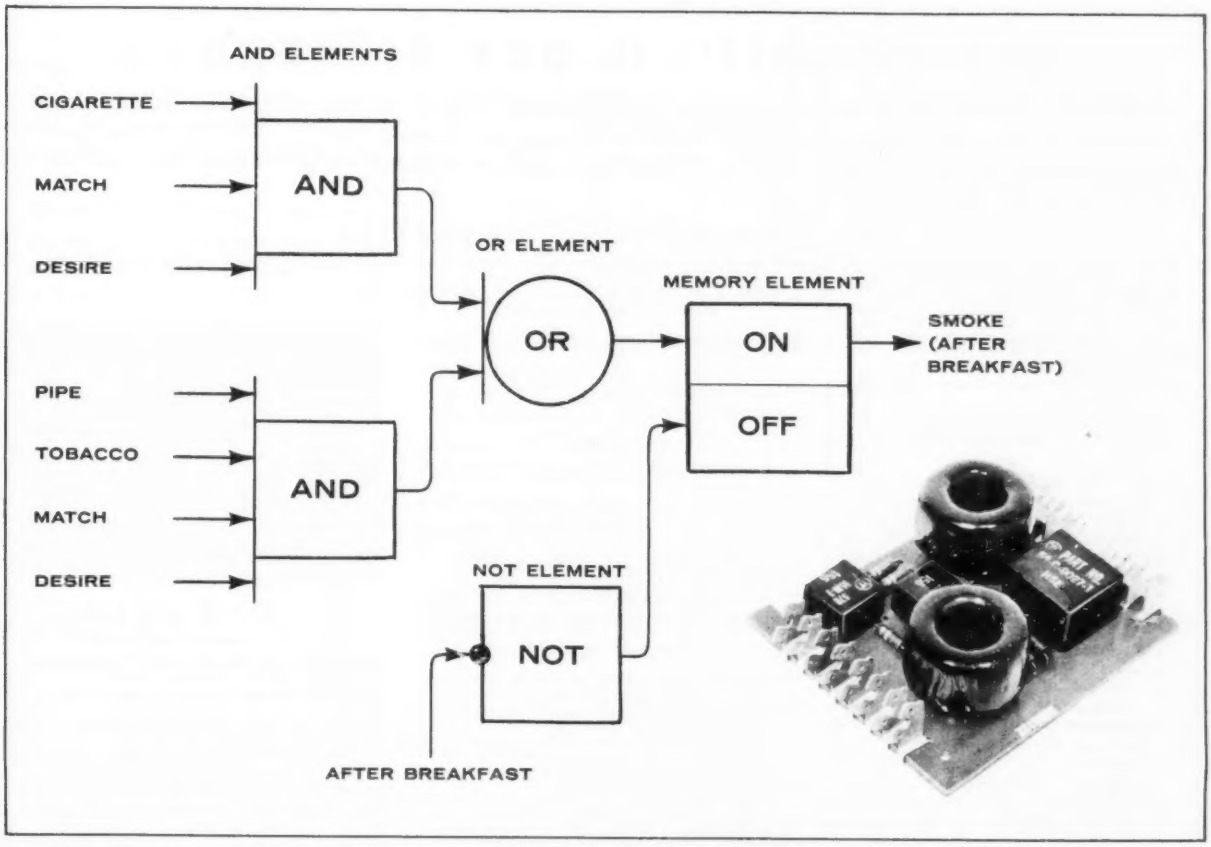


AND function. Output only occurs with *all* inputs received.

OR function. Output occurs when *any* input is received.

NOT function. An output occurs only when there is *no* input.

MEMORY function. Output occurs after 1st input continuing until 2nd input.



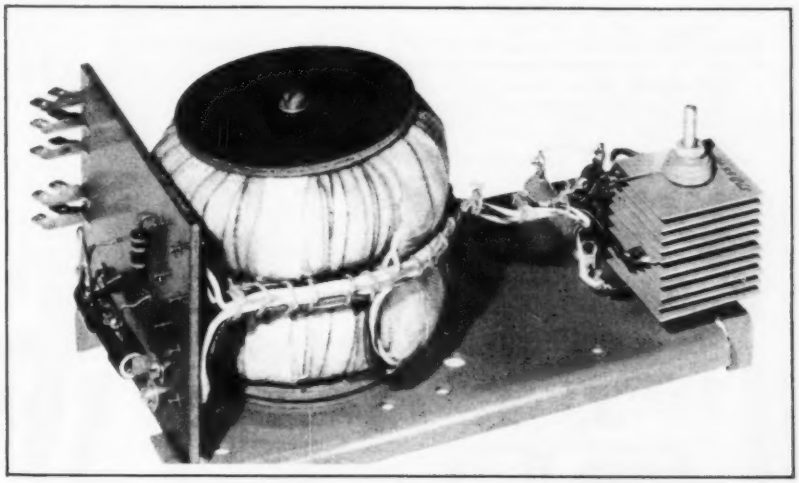
FUNCTIONS

The four logic functions discussed are not peculiar to CYPAK systems. They are being produced in existing control systems with conventional relays. But relays have inherent disadvantages which are becoming increasingly evident as the demands on industrial control increase.

Conventional relay systems are complex and hard to maintain. Also, the possibility of having to base broad automation on a device with no higher degree of reliability than the conventional relay is not attractive, nor can relays be considered practical as control systems continue to become more and more complex.

The relay's great weakness—lack of the required high degree of reliability—is a natural consequence of its construction. It has moving parts, which are subject to wear. It has contacts that change with time, erode and are strongly subject to environmental conditions.

This is where CYPAK comes in. The strongest advantages of CYPAK systems are reliability and long life, provided through their completely static nature. The main components are magnetic amplifiers or transistors, selenium or silicon diodes, and resistors—none of which have any moving parts. By proper circuitry, these components have been made to perform the same functions as relays do. Magnetic amplifiers have proved themselves to be reliable and excellent performers in industrial control circuits, and for this reason have been selected as the basis of today's CYPAK circuits.



50-VA Power Amplifier For CYPAK System.

"OLD RELIABLE" IS OUR NICKNAME!

LOVE THAT NICKNAME! It means that if you need Loaders, Cutters, Shuttle Cars, Substations, Copper Wire, or any other type of MINING EQUIPMENT, you can depend on J. T. FISH. Or if you have surplus equipment of any type to SELL, whether one item or a complete coal mine, you can rely on us for a fair deal ALWAYS!

WE OWN WHAT WE ADVERTISE

Buy from the largest stock of good mining equipment in America. Includes all types of Joy Cutters, Loaders, Shuttle Cars, Cat Trucks, Belt Conveyors, Chain Conveyors, etc.

JOY EQUIPMENT—Rebuilt

3—Joy 20BU Loaders, latest type.
3—Joy 14BU, low pedestal loaders, 38-J Head Motors.
2—Joy 12BU Loaders, 7E, excellent.
1—Joy 14BU, 7BE Loader, 10 H. P. head motors.
6—Joy 8BU Loaders.
3—Joy 11BU Loaders.
6—Joy 8SC Shuttle Cars, lowest type.
2—Joy 32E9 Shuttle Cars.
2—Joy 32E10 Shuttle Cars.
6—Joy 32E15 Shuttle Cars.
1—Joy T-1 Standard Cat Truck.
1—Joy T-2-5 Cat Truck, AC.
5—Joy T-2-5 Cat Trucks, 250 volt DC.
1—Joy T-2-6 Cat Truck with reel.
4—Joy 11B Cutting Machines, like new.
1—Joy 7B Cutting Machine, excellent.
5—Goodman 660 Loaders on cats, excellent.
8—Goodman Machines on cats, 31" high. All hydraulic.
1—Goodman 512 Cutting Machine with Bugdusters, like new.
3—Jeffrey 29UC Cutting Machines, cat mounted, perfect.

LOCOMOTIVES

2—Jeffrey 20 ton, type MH-110, 42" and 44" Ga.
4—Jeffrey 13 ton, MH-110, 36", 42" and 44" Ga.
3—Jeffrey 10 ton, type MH-78, 42" and 48" Ga.
12—Jeffrey 6 ton, type MH-88, 42", 44" and 48" Ga.
3—Jeffrey 4 ton, type MH-96, 42", 44" and 48" Ga.
1—G.E. 4 ton, type 825 Locomotive, 26" high.
10—G.E. 6 ton, types 801, 803, 821 Locomotives, 42", 44" and 48" Ga.
1—G.E. 8 ton, type 822 Locomotive, 44" Ga.
3—G.E. 10 ton, type 809 Locomotives, 42", 44" and 48" Ga.
1—G.E. 10 ton, 829 Locomotive, 36" Ga.
1—Goodman 4 ton, 8-30 Locomotive, 22" above rail.
8—Goodman type 33, 6 ton, 44" and 48" Ga.
2—Goodman 8 ton, type 32A, 44" and 48" Ga.
3—Westinghouse type 902, 4 ton, 42" and 48" Ga.
2—Westinghouse type 904, 6 ton, 44" and 48" Ga.
2—Westinghouse type 906, 44" and 48" Ga.
2—Westinghouse type 907, 10 ton, 44" and 48" Ga.

TIPPLE EQUIPMENT

1—Cedar Rapids portable super Screening Plant.
1—Portable Belt Conveyor 20', gas driven.
1—Railroad Car Unloading Conveyor, gas driven.
1—Allis Chalmers 5' x 14' Rippflo Vibrator.
1—4' x 10' Robbins Gyrex Vibrator.
1—4' x 14' Vibrator, three deck, low head.
Feeders, Drag Conveyors and Loading Booms.

CUTTING MACHINES

3—Jeffrey 29UC Universal on cats.
4—Baby Goodman 212's, rebuilt.
3—Goodman 312's, 18" high.
3—Goodman 412's, 18" high.
1—Goodman 512, with Bugduster, like new.
15—Goodman 12AA's and 112AA's.
10—Goodman 324 Slabbers.
2—Goodman 224 Slabbers.
2—Goodman 724 Slabbers.
30—Jeffrey 35L's, like new, 17" high.
15—Jeffrey 35B's and 35BB's.
2—Jeffrey 29B's on track.
1—Jeffrey 29L, track mounted.
2—Jeffrey 29C's, track mounted.
1—Jeffrey 29U, Universal, track mounted.
1—Sullivan CR-10, 15" high.

LOADING MACHINES

7—Joy Loaders, all types.
2—Jeffrey 61 CLR's on rubber, 26".
3—Jeffrey L-500 Loaders.
2—Goodman 360 Loaders.
3—Myers Whaley No. 3 Automat Loaders.
3—Clarkson Loaders, 26" above rail.

CONVEYORS

2—Joy 30" Belt Conveyors, 10 to 15 H. P.
2—Goodman 97-C's, 26".
3000'—30" Conveyor Belt.
8—Jeffrey 61AM Room Conveyors, 300 ft.
10—Jeffrey 61HG Face Conveyors.
5—Room Conveyors, type 400, 300 ft.
2—61EW Elevating Conveyors.
2—61WH, 15" Room Conveyors, 300 ft.
4—Joy Ladel UN-17 Shakers.
10—Goodman G-12½ and G-15 Shakers.

CONVERTERS AND DIESEL PLANTS

3—100 KW, G.E. TCC-6's, 275 volt Rotary Converters.
3—150 KW, G.E. HCC-6's, 275 volt Rotary Converters.
1—200KW, G.E. HCC-6 Rotary Converter, 275 DC.
3—300KW, G.E. HCC-6 Rotary Converters, 275 DC.
1—200KW Westinghouse Rotary Converter, 275 DC.
1—300KW Westinghouse Rotary Converter, 275 DC.
1—500KW Westinghouse Rotary Converter, 275 DC.
(All the above with 6900/13000 and-or 2300/4000 primary transformers).
2—150 KW MG Sets, G.E. and Westinghouse.
1—200KW MG Set, General Electric.
1—300KW MG Set, General Electric.
1—500KW MG Set, General Electric.
1—Cummins 125 KW, 250 Volt DC.
1—700 H.P. Shaft Hoist, complete.
Complete steam plant, will sell all or any part.
Boilers, like new, 1100 H. P., 500 H. P.
Also Transformers, Turbines, etc. Complete Tipples with Cleaning Plants.

MISCELLANEOUS

10—Air Compressors, 1 H. P. to 40 H. P.
40—Mine Pumps, all types.
Pipe, plastic, steel transit, all sizes 1" to 6".
35—Mine Cars, drop bottom, 42" Ga.
150 Mine Cars, 18" high, end dump, 44" Ga.
300 Mine Cars, end dump, 20" high, 48" Ga.
15—Brown Fayro HKL and HGD Car Spotters.
1—12 ton Differential Slate Larry.
4—Overhead Bridge Cranes.
1—Kanawha Hillside Dump.
5—Low Vein Water Cars.
Incline Hoists, 25 to 50 H.P.
Machine Tools for Mine Shops.
400 Tons Rail, all sizes.
10 tons Copper Trolley and Feeder.
300 Transformers from 1 to 2000 KVA, 110 to 13,000 Primary Volts.
400 Electric Motors, 3 to 200 H. P.
Suspension Bridge, 300' long for river crossings.
1—International TD-24 Angledozer.
1—International TD-18 Angledozer.
Huge stock of mine supplies.

THOUSANDS OF OTHER ITEMS **SEND US YOUR INQUIRIES**

It Doesn't Cost—It Pays to Buy From

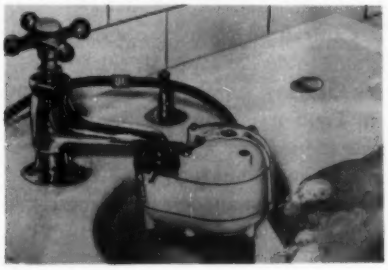
J. T. FISH & COMPANY

Logan, W. Va. **Phone 2825**

BACK RIPPERS

New, oversize Back-Rippers for Caterpillar D9 Tractors have been introduced by Preco Incorporated, Los Angeles. The Rippers are available for Caterpillar No. 9S straight blade Bulldozers.

Complete information on Back-Rippers can be secured by writing Preco Incorporated, 6300 E. Slauson Avenue, Los Angeles 22, California.



PORTABLE HOT WATER HEATING PLANT

A simple, inexpensive way has now been found to produce HOT WATER from any cold water faucet with a fabulous unit called THERMOJET! . . . A 100% Automatic Faucet Water Heater.

Every cold water faucet is now a "hot" prospect. With the simple THERMOJET attachment, the coldest water is turned piping-hot. . . . INSTANTLY! As a matter of precise fact, within 2 seconds.

The unique feature of THERMOJET is the long water path, made up of a series of winding, constricted channels which produce an electrical resistance of over 500,000 ohms, permitting a current flow of less than 1/5 of a milliampere, thus providing complete safety. Another feature is the fact that the faucet handle regulates the temperature of the water. Turn it on just a little and the water is steaming, turn it on more, and the water is hot, turn the faucet handle all the way and the water is warm. When the faucet is turned completely off, no current is used, even though the unit remains plugged in. This fine feature of THERMOJET contributes tremendously to saving in electricity, because the hot water is used only as is needed.

DRAGLINE

Model 7200 MARION Walking Dragline; 110 Ft. Boom, (2) 6½ Yd. Buckets, Cooper-Bessemer Engine Rebuilt May, 1956. Cummins Swing Motor, New. Machine new 1950. Price, including spare parts . . . $100,000.00

ANDERSON EQUIPMENT CO.
Box 1737, Pittsburgh 30, Pa.
Phone: LEhigh 1-6020

Two-Inch
SUCTION HOSE

25-Foot sections, heavy duty suction hose with brass couplings. For sale at jobbers price of $36.94 per section.

Meyer Bros.
Phone 701, Philipsburg, Pa.

A NEW pocket-size review of the earth-moving and construction machinery manufactured by the Allis-Chalmers Manufacturing Company is now available from the company's Tractor Group.

The two-color booklet (MS-1107) presents the line and matched allied equipment through pictures of each model tractor, motor grader, motor and pull-type scraper, and power unit, all briefly and concisely described.

DRAGLINE

LIMA Model 1201 with 80-ft. Boom. G-M Diesel Engine with one rebuilt spare Cummins Engine. (1) 3 Yd. PAGE and (1) 3½ Yd. HENDRIX Bucket. Machine new in 1951-Priced Right.

ANDERSON EQUIPMENT CO.
Box 1737, Pittsburgh 30, Pa.
Phone: LEhigh 1-6020

Locate the trouble quickly — easily in your hydraulic system

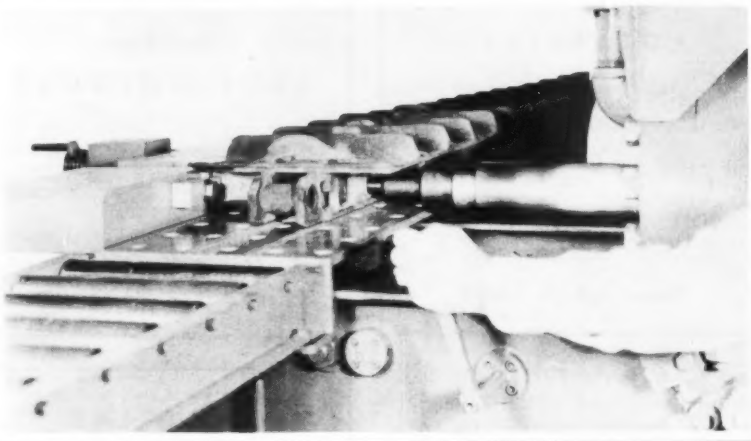
Schroeder Portable Hydraulic Circuit Tester

The new Schroeder Hydraulic Circuit Tester speedily checks the operating efficiency of your hydraulic circuit components.

Weighing only 19 pounds it is housed in a convenient, sturdy carrying case, size 7" x 11" x 8¾" and can be carried without effort to the machine location. After the proper connections are simply made, by rubber hose, the tester simultaneously measures the temperature, pressure and flow from the component port under test. The unit has a pressure range of 300 to 2000 PSI and a maximum flow of 50 GPM.

Check out your hydraulic system's operation—order a Schroeder Portable Hydraulic Circuit Tester today—literature and prices on request.

SCHROEDER BROTHERS
CORPORATION
HYDRAULIC, ELECTRIC AND PNEUMATIC EQUIPMENT
3116 PENN AVE. PITTSBURGH 1, PA. EXPRESS 1-1571

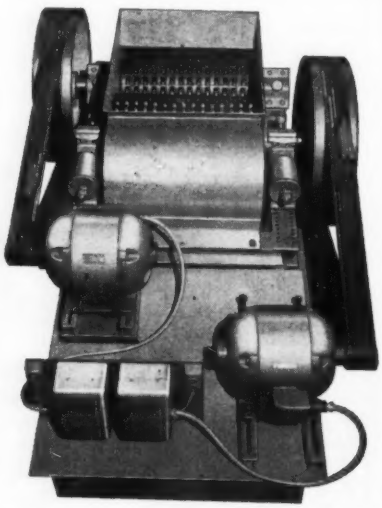


SCOTTDALE MACHINE, FOUNDRY & CONSTRUCTION CO.

DEPT. CM BOX 51 SCOTTDALE, PA.

DOUBLE ROLL

COAL CRUSHER



EFFICIENT . . . produces a more uniform product!

ECONOMICAL . . . uses less power!

BOOSTS . . . sales—profits!

NO. 63 SPECIAL — 2 Motor Drive — Produces a Product ¾" to 8". Equipped with Two Grooved Flywheels. (No Gears)

Efficient and practical the shredding action of the crusher's tooth studded double rolls turns out a more consistent product. Quality produced forged steel tooth gears, welded steel base, bronze bushed journal bearings, welded steel hopper and grooved flywheels.

TRACK PIN PRESSES

For removal and installation of pins and bushings of crawler tracks, Lempco Products, Inc. of Bedford, Ohio, has announced the New Model 565 "Powermatic" Track Pin and Bushing Press.

Special tools and adapters are available with the press to service tracks from the smallest to largest models of Allis-Chalmers, Caterpillar, Euclid, International and Oliver tractors.

Centralized controls enable the operator to do the complete job of pressing bushings and pins both out and in. Field tests indicate that the press can reduce pin and bushing replacement time as much as 50%.

With automatic pressure controlled ram head and recessed ram nose, this 150-ton hydraulic press has two ram speeds—180 inches per minute up to 30 tons pressure and 30 inches per minute over 30 tons. Convenient lever permits positive control of the ram at all times—starting, stopping and retracting at any position. Buttress and jaws are adjustable and retractable to facilitate proper spacing of links and compensate for worn or bent tracks.

Over-all dimensions of the Track Press are 36" wide, 125" long and 63" high. Roller conveyor sections with stands are available for holding and moving the track in position for pressing.

For shop use the stationary model is electrically powered—for field use a wheel mounted model with trailer hitch is powered with gasoline engines, water cooled or air cooled.

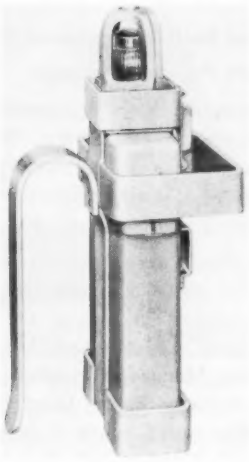
Descriptive literature with application data for tooling may be obtained by writing Lempco Products, Inc., 5490 Dunham Rd., Bedford, Ohio.

DO YOU KNOW? (Cont'd from Page 5) greater employment. This will be followed by "greater production, lower costs, and wider markets." Dr. Engstrom foresees a change in the pattern of industrial competition as the end product.

At the same time, he pointed out, significant changes will occur in the concepts of management, including a much larger capital investment per worker, as well as more information available to control production and distribution.

The greater use of automation to assist human effort, he explained, is necessary if the American economy is expected to continue to expand.

NEW EDISON TRIP LAMP



A new Edison Four-Cell Trip Lamp that provides greater visibility and dependability for all types of mining conditions has just been made available by Mine Safety Appliance Company, Pittsburgh.

Approved by the U. S. Bureau of Mines, the new trip lamp is rectangular in shape and designed to be hung quickly by its forged steel hook on the side or back of any mine car.

The battery, consisting of four cells in series, has a rating of 4.85 volts at 1 ampere. It may be recharged on any Edison R-4 lamp charging rack without additional equipment. The battery is removed from its holder by opening a magnetic lock.

The new lamp provides illumination from all angles and the bulb is enclosed in a heavy ruby glass cylinder protected by a sturdy cast-steel ribbed guard that forms part of the holder.

Development of the lamp, according to MSA engineers, resulted from the need for an assembly that not only is sturdy and dependable to withstand abuse but also can be recharged on standard charging equipment.

Details on the new Edison Four-Cell Trip Lamp are included in a newly-published bulletin describing the complete line of Bureau of Mines-approved special Edison Electric Lamps. Copies will be sent on request for Bulletin No. 0201-2 to Mine Safety Appliances Company, 201 N. Braddock Avenue, Pittsburgh 8, Pa.

TRUCK-MOUNTED TELESCOPIC HOISTS

Publication of a new 4-page catalog, describing the Galion line of truck-mounted telescopic hoists, is announced by Galion Allsteel Body Company, Galion, Ohio.

The 2-color catalog contains complete descriptions, condensed specifications, illustrations and action photos covering Galion's Uni-scopic single cylinder and Duo-scopic twin cylinder front mounted hoists. Cutaway illustrations of Galion-built telescopic cylinders and matching high-volume roller bearing hydraulic pump are also included. Model NF series dump bodies, for use with Uni-scopic hoists, are shown and described.

Relocation of hoist and payload weight forward onto the truck's front axle permits hauling of up to 1500 lbs. extra payload within legal axle weight limits with Uni-scopic and Duo-scopic hoists and matching dump bodies, the manufacturer states.

Catalog copies may be obtained from local Galion Allsteel distributors or by writing direct to Galion Allsteel Body Company, Galion, Ohio. Ask for catalog LL-3059.

Use this Wire Rope on your toughest mining job—it's made to meet your needs!

Wherever you use Wire Rope—for scraper loaders, mine hoists, draglines, strip shovels, on mining machinery—you'll find MONARCH WHYTE STRAND Ropes have the toughness and flexibility to give you longer heavy-duty service at lower cost. These Ropes are *designed* to serve well under the toughest going—built to fit your needs and service conditions.

MONARCH WHYTE STRAND wire ropes have all the quality features it takes to give you outstanding service. They are supplied PREformed and Internally Lubricated to resist abrasion, corrosion, and internal friction. These Macwhyte Mining Ropes are available in every wire rope classification.

Macwhyte makes a thousand and one types, sizes, and grades of WHYTE STRAND wire rope. This assures a right rope for every mining use and service condition. Try WHYTE STRAND on your toughest jobs—and see for yourself!

NORTHEASTERN SUPPLY CO.

321 CHERRY AVENUE • CANTON, OHIO

Also headquarters for **JEFFREY** Chains, **DIAMOND** Roller Chains, Sprockets and Flexible Couplings, **JOHNS-MANVILLE, GATKE, RAYBESTOS,** and **VELVETOUCH** Friction Materials.

Branch:
ZANESVILLE SUPPLY CO.
75 MAYSVILLE AVENUE
ZANESVILLE, OHIO

NEW APPOINTMENTS

Edward J. Carroll

E. H. Johnson, manager of the Mining Tool Division, Kennametal Inc., Bedford, Pa., has announced the appointment of Edward J. Carroll as assistant sales manager.

Mr. Carroll comes to Kennametal from the Coal Division of U. S. Steel Corporation in Uniontown. For eight years he was employed at Robena Mine and was assistant superintendent for the last three years. Before that Mr. Carroll spent five years in the Mining Engineering Department.

In addition to a bachelor of science degree in Mining Engineering from the University of Notre Dame, Mr. Carroll holds a master of business administration degree from the Harvard Graduate School of Business. Recently, in addition to his work at Robena, he has been teaching a Penn State extension course for mine inspectors. He holds several state mining certificates, including that of first grade mine foreman.

Mr. Carroll is a member of the National Mine Rescue Association, Coal Mining Institute of America and Pittsburgh Coal Mining Institute. His headquarters will be at Kennametal's Mining Tool Division in Bedford.

Lewis C. Black

Lewis C. Black has been appointed Sales Manager—Large Machines for Bucyrus-Erie Company, effective July 1, according to an announcement by the company's main office in South Milwaukee, Wisconsin. He succeeds R. M. Dickey, who resigned April 15. Black will be responsible for all domestic sales of quarry and mine machines, walking draglines, stripping shovels and draglines, and railway cranes. He will report to L. E. MacDonald, general sales manager.

Black is a native of New Jersey and a graduate of Lehigh University from which he holds a BS degree in mining engineering. Immediately upon graduation in 1935 he joined Bucyrus-Erie as a special apprentice, and has been with the company ever since.

After completing his training in 1937, he was assigned to the Chicago office as a district representative for small machines. In 1940 he was transferred to St. Louis where he likewise served as district representative for small machines.

Two years later, he became a district representative for large machines at Kansas City. In 1949 he was transferred to New York, where he worked in the same capacity until October, 1955. At that time he was appointed Assistant Eastern District Manager.

Cleveland Brothers Equipment Co. Announce Personnel Changes

Cleveland Brothers Equipment Co., with plants in Harrisburg, Wilkes-Barre and Frackville, recently announced the following promotions and personnel changes:

Ed Ryder, Vice President in charge of Service and Parts; John Farnham, Vice President in charge of Sales; George Scott, Assistant Sales Manager; Al Walter, Manager Harrisburg Sales Office; William Staley, Used Equipment Manager; Larry Cibellis, in charge of Credit and Receivables Dept.; William Zengerle, Assistant Treasurer and Harrisburg Office Manager. Allan Houghwout, Office Manager & Assistant Sales Manager at the Wilkes-Barre plant. Changes in salesmen's territories include — Ralph Barnes will represent Cleveland Brothers in Southern Luzerne and Columbia Counties; Fred Swenson in Carbon, Monroe, Pike and Wayne Counties; John Thomas in Tioga, Bradford, Susquehanna, Sullivan and Wyoming.

4500 Manitowoc Draglines

All 120' Booms, 5-Yard Buckets

1—One Month Old

1—Six Months Old

2—1954 Machines

1—1953 Machine

1—1951 Machine

All powered with Caterpillar D-386 Engines

FRANK SWABB Equipment Co., Inc.

313 Hazleton Nat'l. Bank Bldg.

Hazleton, Pa. GLadstone 5-3658

TANDEM AXLE TRAILER DUMP

Galion Model STMF Transporter trailer dump, with Model 85180 Uni-scopic hoist.

A new tandem axle trailer dump, with front mounted telescopic hoist and designed for operation with single rear axle tractors, is announced by Galion Allsteel Body Company, Galion, Ohio.

Designated Model STMF Transporter, the new trailer dump is reputed to be best suited for economical materials hauling in areas where weight laws establish a medium gross weight limit and allow credit for only one set of tandem axles. Use of the front mounted Uni-scopic telescopic hoist shifts hoist weight forward onto the tractor axles and is said to permit additional loading of the trailer axles. According to the manufacturer, exceptional stability in dump position and on the highway is afforded by the matched design of body, chassis and Uni-scopic hoist. Also, the unit is designed to permit direct dumping into road surfacing spreaders.

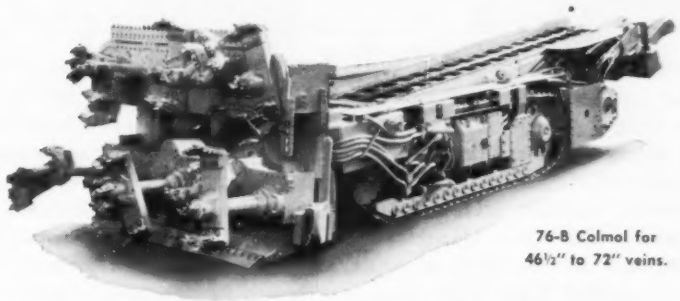
Offered in body lengths from 19 to 24 ft., Model STMF Transporters have payload capacities of 10 to 40 cubic yards. Three optional Uni-scopic hoists, with lifting capacities up to 30 tons, are available.

Construction of Model STMF combines maximum strength with minimum weight, the manufacturer says. Ten gauge, high resistant steel is used throughout the body. Understructure consists of closely spaced 4 in. channel crossmembers gusseted and welded to 6 in. I-beam longitudinals. The compact hoist well, fully welded and reinforced to distribute hoist lifting forces uniformly, is fitted with a removable access cover for hoist cylinder inspection.. The chassis, of fabricated steel construction, is supplied with tandem Stabl-ride or center pivot bridge type suspension. A full selection of axle capacities, brake types, tires and optional equipment is offered.

For further information, see local Galion Allsteel distributors or write direct to Galion Allsteel Body Company, Galion, Ohio. Ask for catalog LL-1234.

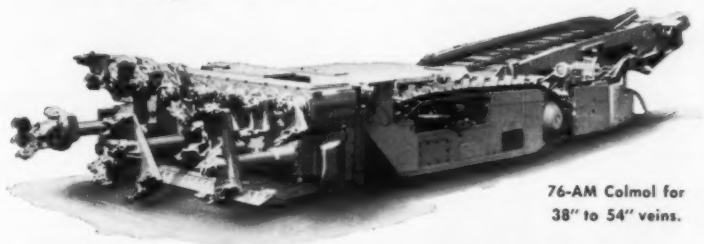
AERODYNE FANS

Catalog #901 by the Jeffrey Manufacturing Co., Columbus, Ohio, describes Jeffrey Aerodyne fans and blowers for mine use. General information is given about the type 12A, type 8H, type 6F and junior Aerodyne fans. Diagrams of typical applications are shown. Various types of drives are also illustrated.



76-B Colmol for 46½" to 72" veins.

for continuous mining in high or low vein coal,



76-AM Colmol for 38" to 54" veins.

the JEFFREY COLMOL®
(PATENTED)

High production, economy, safety —the formula for successful operation of tomorrow's mines. The Colmol gives all three . . . is proving its superiority with tonnage records in today's mines.

The Colmol is a big producer because it advances with minimum maneuvering. Up to 80 tons per man-shift in low coal; up to 100 tons per man-shift in high veins.

The Colmol is economical because it lowers cost-per-ton figures. It is powerful and sturdy for long trouble-free runs and minimum downtime.

The Colmol is safe because it eliminates explosives, provides centralized controls in a protected position for operator 20 feet from face.

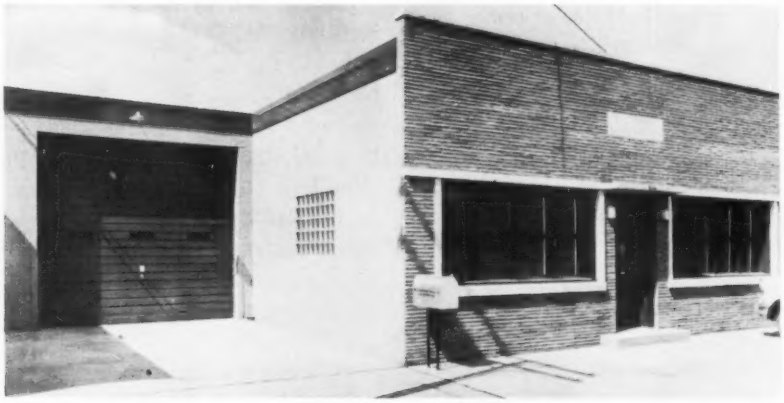
Write for Catalog 877 describing 76-AM Colmol for low veins or Leaflet 887 describing 76-B Colmol for high coal.

JEFFREY

MINING • CONVEYING • PROCESSING EQUIPMENT
TRANSMISSION MACHINERY • CONTRACT MANUFACTURING

THE JEFFREY MANUFACTURING COMPANY • COLUMBUS 16, OHIO

JEFFREY MFG. CO. NEW DISTRICT OFFICE AND WAREHOUSE



Thomas E. Davis

A new District Office and Warehouse for its Mining Division has been opened in Evansville, Indiana by The Jeffrey Manufacturing Co., Columbus, Ohio. Mr. Thomas E. Davis is District Manager and Mr. Owen Donham is Warehouse Manager.

The new concrete block structure, located at 1066 Diamond Avenue, is 125 ft. by 45 ft., with two offices for district and warehouse business occupying the front area. A truck drive-in with push-button door and a hydraulic floor lift facilitate loading and unloading activities in the warehouse area.

Davis has 22 years' mining sales experience with Jeffrey, being formerly with the company's Chicago office. He is a member of the Illinois Mining Institute, Mining Electrical Group of Illinois, and on the Board of Directors of the Indiana Mining Institute.

Donham has had 20 years of warehousing experience with Jeffrey in Terre Haute, Indiana; St. Louis, Missouri, and Mt. Vernon, Illinois.

CATERPILLAR TRACTOR CO. Announces NEW APPOINTMENTS

E. C. Chapman

F. S. Foster

R. E. Ehni

Caterpillar Tractor Co., Peoria, Ill., announces the appointment of E. C. (Chappie) Chapman as sales manager of the Eastern Division. He formerly was assistant manager of this division. W. E. McCoy, former sales manager of eastern division, has been transferred to the San Francisco office which is headquarters for the two western divisions.

Chapman graduated from the University of Cincinnati with a civil engineering degree in 1942. He served in both the European and African theaters in World War II. He joined Caterpillar in 1945.

Frank Foster, presently assistant sales manager of the Southwest Division, will transfer to the Peoria office to assume the duties formerly held by E. C. Chapman. Foster obtained a B.S. degree from the University of Wisconsin. He served in several responsible positions prior to joining Caterpillar in 1945.

Ralph Ehni, now serving as district representative in the Northwestern Division, will be assigned the duties formerly held by Frank Foster.

Ehni, a graduate of University of Illinois, has been with the company since 1942 after a hitch in the Navy. Prior to becoming a district representative, Ehni worked in the governmental division office in Washington, D. C.

All the above changes were effective May 1, 1956.

"EUCLID" SCRAPER

Euclid Division of General Motors has just published three catalogs describing the overhung engine line of "Euc" Scrapers, Models S-7, S-12 and S-18. Each of the three-color catalogs contain 8 pages of cut-a-way views of major components and photographs that help to explain the accessibility and operating features. Condensed specifications are included to provide data on engines, transmissions, tires, scraper controls, weights and dimensions. These also show a performance table showing speeds and grade ability. Illustrations and action views show how hydraulic lever action of apron, bowl and ejector provides fast, independent control of all scraper operations.

Catalog 505 covers the S-7 Scraper which has a payload capacity of 7 cu. yds. struck, 8 yds. at 3 to 1 slope, and 9 yds. heaped at 1 to1. The Model S-12, described in Form 506 carries 12 yds. struck, 14 yds. heaped at 3 to 1 and 16 yds. at 1 to 1 .

Torqmatic Drive that consists of torque converter with semi-automatic transmission is a feature of the S-18 Scraper described in catalog 507. This power train eliminates manual shifting and permits changing from one speed range to another under full power. This model has an 18 yd. capacity struck and rated payloads of 21 yds. heaped at 3 to 1 and 25 yds. at 1 to 1 slope.

Copies of these catalogs are available from Euclid dealers or by writing Euclid Division, General Motors Corporation at Cleveland 17, Ohio.

EUCLID NEW REAR DUMP

The new R-15 Rear-Dump Euclid is described in a new 8-page catalog just released by Euclid Division. Rated payload of the unit is 15 tons with standard 14.00 x 24 tires . . . 18 tons with optional 16.00 x 25 tires.

The 3-color catalog illustrates the major design and operating features of the new rear-dump model for off-highway hauling. It also provides performance data and general specifications.

SHOVELS — DRAGLINES
DRILLS
TRACTORS — TRUCKS

190-B Bucyrus-Erie Elec. 8 yd. Shovel.
170-B Bucyrus-Erie Elec. 6½ yd. Shovel.
120-B Bucyrus-Erie Elec. 5 yd. Shovel.
1600 P & H 6 yd. Electric Shovel.
2400 Lima 6 yd. Diesel Shovel.
111-M Marion 3½ yd. Diesel Shovel.
955 P&H 2½ yd. Diesel Shovel.
54-B Bucyrus-Erie 2½ yd. Diesel Shovel.
80-D Northwest 2½ yd. Diesel Shovel.
22-B Bucyrus-Erie ¾ yd. Shovel.
7400 Marion Elec. Drag 200' boom, 8 yd.
625 Page Diesel Drag 160' boom, 9½ yd.
2400 Lima Diesel Dragline 130', 5 yd.
4500 Manitowoc Diesel Drag 120', 5 yd.
1055 P&H Diesel Dragline 80', 4 yd.
3500 Manitowoc Diesel Drag, 85', 2½ yd.
595 Link Belt, 75', 2½ yd., independent boom hoist.
600 Reich Heavy Truck Mounted Rotary Drill.
Quarrymaster Drill with 2-500 cu. ft. compressors.
58-BH Joy Champion Rotary Air Drills.
Also 42-T, 29-T & 27-T Well Drills.

Euclid Trucks--Many to Choose From

FRANK SWABB
EQUIPMENT COMPANY, INC.
313 Hazleton Nat'l. Bank Bldg.
HAZLETON, PA. **GLadstone 5-3658**

Save on Your
INDUSTRIAL TRACK

FOSTER QUALITY **FULLY GUARANTEED**
RELAYING RAILS

Handle more cars better—cost less to install and maintain. Foster stocks all Rail Sections 12# thru 175#, Switch Material and Track Accessories.

SEND FOR CATALOGS

RAILS - TRACK EQUIPMENT - PIPE - PILING
L.B. FOSTER co.
PITTSBURGH 30 • NEW YORK 7 • CHICAGO 4
ATLANTA 8 • HOUSTON 2 • LOS ANGELES 5

McCARTHY
COAL AUGER
150 Ft. of 24", 30" & 36" AUGERS
GMC Diesel Engine
VERY GOOD CONDITION

FRANK SWABB
EQUIPMENT COMPANY, INC.
313 Hazleton Nat'l. Bank Bldg.
Hazleton, Pa. **GLadstone 5-3658**

NOW at
BECKWITH
MACHINERY COMPANY

BORED BUY

USED EQUIPMENT

Item 456-P450 Caterpillar D7 Tractor with LeTorneau Straight Blade and Rear Double Drum Cable. Starting engine tuned up; diesel engine serviced and adjusted; master clutch, steering clutch and brakes checked; installed new bellows, seals and bearings in final drives; installed new idler shafts and bushings; new track frame shields and engine hood; sprockets, idlers, roller and track are in good condition. F. O. B. Pittsburgh, Pa. **$6300.00**

Item 655-WV151 Caterpillar D7 Diesel Tractor mounted with LeTorneau Straight Dozer and Rear D. D. Cable Control. Installed new pre-cleaner; steam cleaned, painted and redecaled complete unit. A good machine for the price.
"BUY & TRY" **$5000.00**

Item 456-P444 Caterpillar Model D4-T4 Cable Hylift with ¾ Yd. Bucket. Starting engine and diesel engine tuned up; used bottom rollers installed; hylift frame repaired; clutches adjusted; serviced, steam cleaned and painted. F. O. B. Pittsburgh, Pa. **$1200.00**

Item 755-WV152 Galion Model 101 Tandem Drive Motor Grader powered by an Int. 4 Cyl. Diesel Engine. Installed one new cylinder liner and completely checked engine. Repaired water pump. Repaired shifter fork in transmission and installed two new gears. Checked all hyd. controls and replaced hyd. pump. Grader is equipped with V-type scarifier and 12 ft. moldboard. Two 9.00x24 front tires and four 13.00x24 rear tires. All tires are in good condition. F. O. B. Clarksburg, W. Va.
"BUY & TRY" **$6500.00**

Item 954-C161 Allis-Chalmers HD14 Tractor with Baker Hyd. Blade. In Running Condition.
"AS IS, WHERE IS" **$2200.00**

Item 256-WV172 International TD9 Diesel Tractor, with Bucyrus-Erie Hyd. Angle Bullgrader. Installed new track link assem. and all new bottom and top carrier rollers. Replaced R. H. track and adjustment bolt. Installed new sprocket guards. New bearings and seals in steering clutches and final drives. Installed new sprocket hubs and new bushings, shafts and seals in front idlers. Adjusted steering clutches, brakes and master clutch. Recovered seat cushions; cleaned, painted and redecaled entire unit. This tractor is in good running condition. F. O. B. Clarksburg, W. Va. **$6400.00**

BECKWITH
MACHINERY COMPANY

6550 Hamilton Avenue, Pittsburgh, Pa.
361-369 Congress St., Bradford, Pa.
Old Town Road, Clearfield, Pa.
1356 E. 12th Street, Erie, Pa.
E. Broadway, Farrell, Pa.
Buckhannon Pike, W. Va. Route 20 (So.), Clarksburg, West Va.

Long Life Facts!

DAMASCUS STEEL 900 A.D.'s BEST

THE TIDE OF MANY A BATTLE WAS TURNED BY FAMED DAMASCUS STEEL. RAZOR-SHARP, SPECIALLY HARDENED, DAMASCUS BLADE HELD ITS EDGE WHILE ORDINARY BLADES BECAME DULL OR BENT.

TRACK BOLT STEEL

BETTER THAN DAMASCUS

THE FINEST DAMASCUS STEEL WAS FAR INFERIOR TO CATERPILLAR'S TRACK BOLT STEEL! BOLTS ARE MADE OF SELECT, HEAT TREATED CARBON STEEL, CAREFULLY DESIGNED AND MACHINED FOR LONG LIFE.

TOUGH, HARD TRACK PINS RESIST WEAR

CAT TRACK PINS ARE "HI-ELECTRO" HARDENED TO PRODUCE A SUPER-HARD SURFACE TO RESIST WEAR, A TOUGH CORE TO RESIST SHOCK AND SHEARING STRESSES.

REMEMBER ONLY YOUR CATERPILLAR DEALER OFFERS YOU GENUINE LONG LIFE CATERPILLAR PARTS

BECKWITH MACHINERY COMPANY

6550 HAMILTON AVENUE, PITTSBURGH, PA.

OLD TOWN RD. CLEARFIELD, PA. — E. BROADWAY FARRELL, PA. — 1356 E. 12TH ST. ERIE, PA. — 361-369 CONGRESS ST BRADFORD, PA.

BUCKHANNON PIKE, W. VA., ROUTE 20, (SO.) CLARKSBURG, WEST VIRGINIA

Advertiser's Index

COAL MINING

June, 1956

Allis-Chalmers	4
Beckwith Machinery	13-14-15-16-27-28
Foster Co., L. B.	27
Frank Swabb	27-28
Highway Equipment Co.	Front & Back Cover-2
Jeffrey Mfg., Co.	25
Licking View Tool Co., The	3
Lusk, Harold C., Co.	3
Northeastern Supply Co.	23
Ohio Machinery Co.	13-14-15-16
Salem Tool Co.	1-3
Schroeder Brothers	21
Scottdale Machine & Foundry Construction Co.	22
Walker Machinery Co.	13-14-15-16

2400 LIMA Draglines & Shovels

2400 Lima Dragline, 120' Boom, 3-6 Yd. Buckets. Hamilton Diesel Engine.

2400 Lima Dragline, 110' Boom, 2-6 Yd. Buckets, Hamilton Diesel Engine.

2400 Lima High Lift Shovel, 67' Boom, 50' Stick, 4 Yd. Dipper, Cat D-397 Diesel Engine.

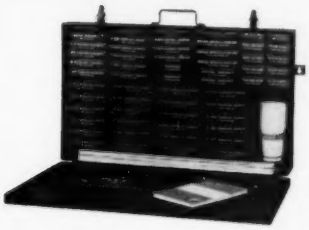
Also, Standard 6 Yd. Shovel Front Attachment for 2400 Lima and 5½ tSandard Shovel Front Attachment for 4500 Manitowoc.

FRANK SWABB Equipment Co., Inc.

313 Hazleton Nat'l. Bank Bldg.
Hazleton, Pa. GLadstone 5-3658

M-S-A Type D ALL-WEATHER FIRST AID KITS

When emergencies call for first aid, these kits provide all the advantages for quick, complete treatment. Unit packages, easily replaced, are arranged for fast selection, contain one or more complete dressings or treatments for each injury. All dressings are sterilized and ready for use. Cellophane package wrappings protect contents. The kits, available in 10, 16, 24, and 36 units, are made of 20-gauge steel, with carrying handle, and mounting brackets. Case is dust and moisture-proof. Ideal for carrying on jeeps, motors or other mechanized equipment. Complete instructions with each kit. Write for details.

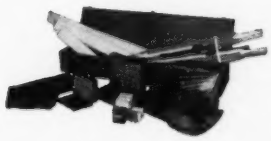


M-S-A MINER'S FIRST AID CABINET

Contains complete assortment of first aid material and supplies. Ideal for mine hospital or dressing stations. Contents conform to U. S. Bureau of Mines recommendations.

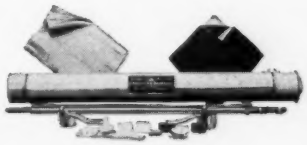
M-S-A FOILLE BURN KIT

Contains four 10-ounce Foille Aerosol Sprays, easy-to-use Type D first aid dressings and accessories. Stored in All-Weather steel case. Permits fast effective burn treatment.



M-S-A EMERGENCY FIRST AID OUTFIT

Ideal for storage underground where a compact unit is needed. Contents selected to meet practically every emergency. Includes two first aid kits, blankets, splints, Redi-Heat Blocks, stretchers. Sturdy steel case.



M-S-A STANDARD STRETCHER OUTFIT

Complete assortment of first aid dressings and supplies arranged in a strong dust-proof canister. Contains stretcher, blankets, first aid materials, splints. Designed for first aid rooms, dressing stations.

M-S-A . . . headquarters for First Aid Equipment

Above are a few of the many first aid supplies and treatments available from M-S-A. This material is the result of years of experience in serving the mining industries' requirements.

Our knowledge of emergency needs has developed the design and contents of our first aid line.

You will find complete information in our Mining Catalog — 20 pages are devoted to illustrations and detailed information on these and many other first aid supplies. We will be happy to send you a copy upon request.

MSA
SAFETY EQUIPMENT HEADQUARTERS

When you need a safety product, M-S-A is at your service . . . our job is to help you

MINE SAFETY APPLIANCES COMPANY
201 North Braddock Avenue, Pittsburgh 8, Pa.
At Your Service—77 Branch Offices in the United States and Mexico

MINE SAFETY APPLIANCES CO. OF CANADA, LTD.
Toronto, Montreal, Calgary, Edmonton, Winnipeg, Vancouver, Sydney, N.S.

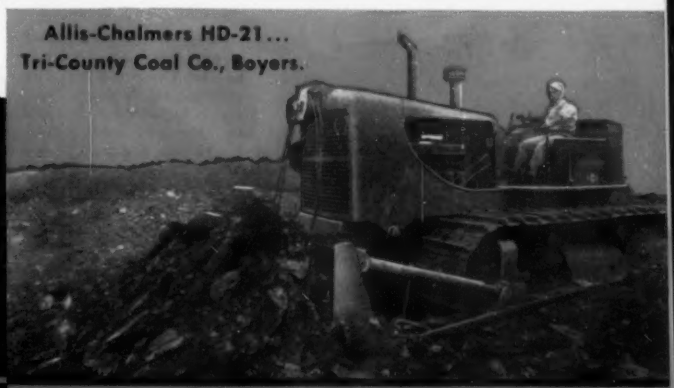
Lima 2400...Boron Coal Co., LeContes Mills.

Mine operators who know their heavy-duty equipment always see *Highway* first!

Highway

EQUIPMENT COMPANY

6465 Hamilton Ave. • Pittsburgh 6, Pa.



Allis-Chalmers HD-21...
Tri-County Coal Co., Boyers.

ALLIS-CHALMERS • GENERAL MOTORS DIESEL ENGINES
LIMA SHOVELS, CRANES, DRAGLINES • BAKER • THOR
POWER-PACK CONVEYORS • GAR WOOD • ERIE BINS
MICHIGAN TRACTOR SHOVELS AND EXCAVATOR-CRANES
MASTER • INTERNATIONAL VIBRO-TAMPERS • JAEGER

AA-2214

Allis-Chalmers HD-21.